AIR CONDITIONING HEATING AND VENTILATING

SEPTEMBER, 1955—52nd YEAR

Joints for Plastic Pipe—page 75

Air Conditioning an Existing Building—page 81

Ventilating an Industrial Plant—page 99

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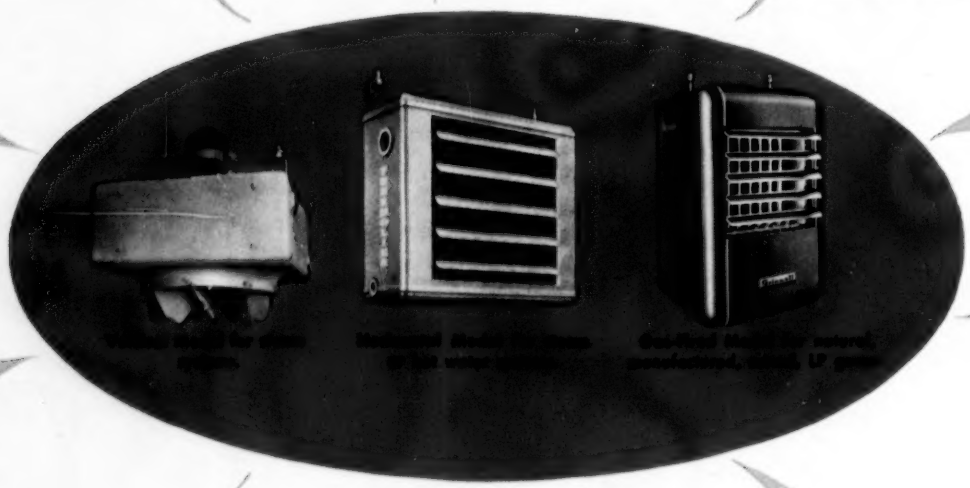
GRINNELL UNIT HEATERS

...for MAXIMUM comfort, economy, and flexibility

Grinnell Unit Heaters bring you many unique design and construction features, coupled with important advantages in comfort, economy, and ease of heating. Heat comes fast, even from a cold start — and is spread uniformly to all parts of the working area. It is not allowed to bank up uselessly under the ceiling. Units are compact. And, both unit and the simple piping are overhead, out of the way, easy to relocate if necessary. Heating capacity often exceeds that of other types costing twice as much.



GRINNELL THERMOLIER
Steam/Hot Water Unit Heater
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Three basic models—horizontal, vertical, and a special horizontal Textile model. (Adjustable velocity nozzle also available for use on horizontal models.) All models have plain thermostatic trap, the simplest and least expensive kind of a trap, made practical because of unit's exclusive internal cooling leg; maximum capacity provided and destructive water hammer eliminated by built-in pitch of tubes. Many other important features.

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Available in 7 sizes — ranging from 25,000 to 200,000 Btu per hour input

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Grinnell Unit Heaters are backed by over 60 years of heating experience, and proved by trouble-free service in countless installations. They are distributed by a coast-to-coast network of plumbing and heating jobbers . . . and in over 30 principal cities, Grinnell engineers can offer on-the-spot advice and help on your heating problems. For new buildings, or for modernizing existing heating systems, it makes good sense to call on Grinnell first — for the unit heater that will meet your specific needs.

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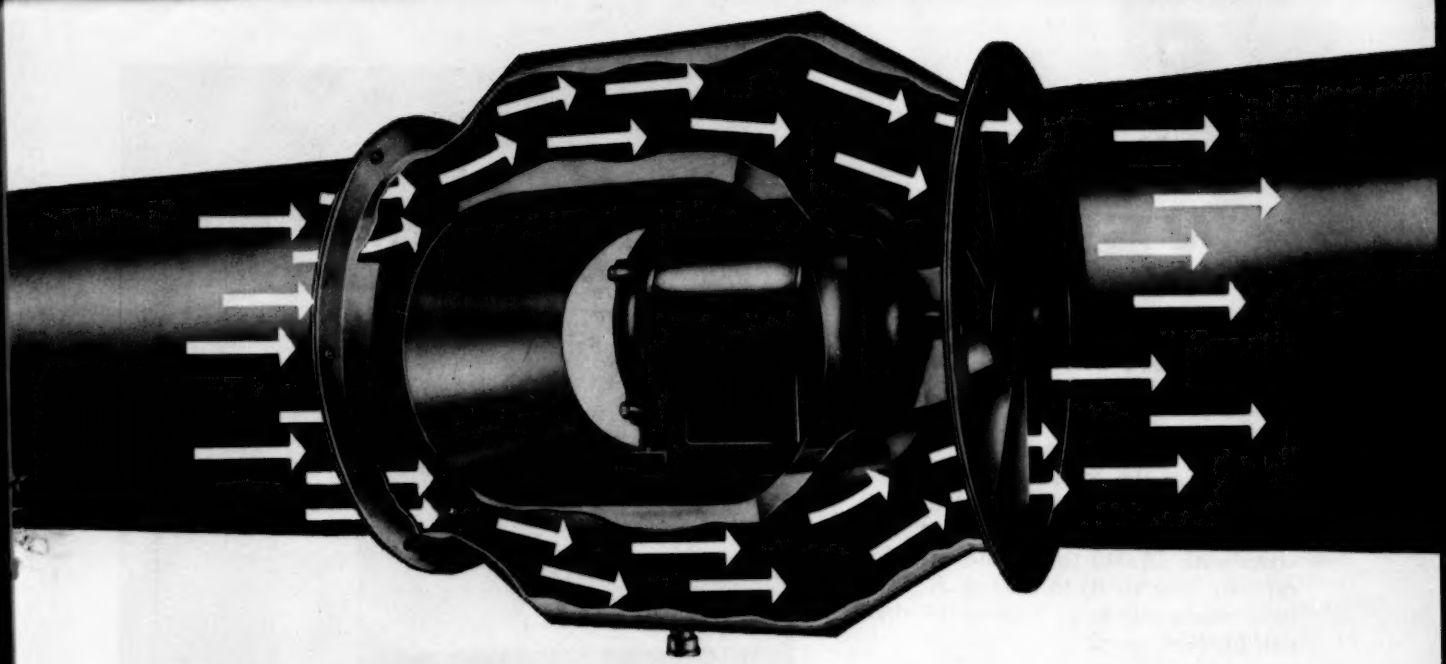
Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems



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EXHAUSTING FUMES THE *DIRECT WAY*

and contains "fan information" section

Reserve your copy of this new Bifurcator® Fan catalog now being printed. The catalog goes into detail on the *direct* way in which the Bifurcator Fan exhausts fumes . . . and also includes the latest improvements made in the Bifurcator Fan itself. This catalog is packed with up-to-date information on Bifurcator sizes and capacities, dimensions, volume and pressure fan wheels, protection against corrosion, and certified capacity ratings.

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- definitions and fan laws
- how to determine static pressure
- velocity pressure table
- friction chart
- loudness level table

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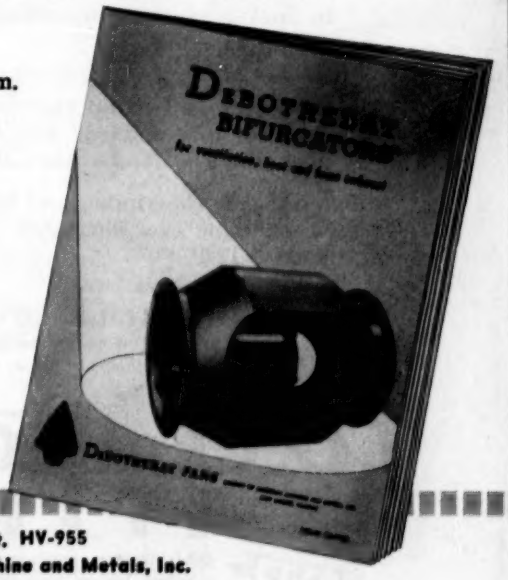

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24 Models . . .
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Other Webster products include a complete line of Unit Heaters for steam, hot water or gas; Webster Walvector and Webster Baseboard Heating; Convectors; Steam and Hot Water Heating Specialties; Webster Moderator Systems of Steam Heating and continuous flow control for hot water heating. Data on request.

AIR CONDITIONING HEATING AND VENTILATING

SEPTEMBER, 1955

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The Cover: Chemical laboratory of the new Spring and Bumper Plant of the Chevrolet Motor Division. Air supply diffusers are installed in the luminous ceiling. Photo courtesy, Albert Kahn Associated Architects and Engineers, Inc., Detroit, Mich.

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HIGH SPOTS

• **A solar engineering exhibit** to accompany the forthcoming (November 1) World Symposium on Applied Solar Energy in Phoenix, Ariz., will show an Italian-built solar engine, furnaces, heat collectors, energy converters and instruments.

• Chicago's Commonwealth Edison reports that **summer demand for current,** boosted by air conditioning during the July heat wave, came within 1.5% of the record day of last Dec. 22. The problem: long days used to give stations a chance to overhaul generating equipment, but in one July week this year they ran close to capacity and burned 37,477 tons of coal a day.

• Pennsylvania Power & Light Co. will build a **privately financed atomic power plant** of at least 150,000 kw using a homogeneous reactor. Completion, with Westinghouse as co-developer, is planned for 1962.

• Effective July 30, **veterans purchasing homes** with the aid of G.I. loans are now required to make a down payment of at least 2%, and the maximum time for repayment of loans will be 25 years. Similar requirements are going into effect on FHA-insured mortgages.

• A chance to review our **progress in atomic energy** will be afforded by 300 papers at the Nuclear Engineering and Science Congress in Cleveland, Ohio, December 12-16, coordinated by Engineers Joint Council.

• A Chicago distributor for G.E. reported 300% **increase in home cooling sales** for July over the same month last year, which he attributed directly to the record hot spell.

• Westinghouse unveiled on July 14 in Cheswick, Pa., the world's first privately financed factory designed to produce parts for **atomic power plants.**

• The window-wall office building may be already **outmoded by air conditioning requirements,** says Henry Wright in Architectural Forum for July. New buildings will use less glass in recognition of the engineering fact that for **every** 100 sq ft of unshaded glass in most of U. S. an additional ton of air conditioning must be provided. Figures show that today's design must be governed by "complex mathematics rather than merely an esthetic credo."

• The world's first all-electric community, a project of 431 homes opened May 30 at Fullerton, Calif., features **a heat pump in each home.**

• A record-breaking increase of 46.4% in shipments of **baseboard-type radiators** for home heating was attained during the first six months of 1955 as compared to the same period last year, according to I.B.R. The increase was the highest in the industry's history, said Robert E. Ferry, the Institute's General Manager.

• Also dramatically ahead of 1954 were first six months figures for 1955 on **cast iron boilers** for home heating which showed a gain of 25%. **Finned-tube-type radiation,** used chiefly for industrial and other types of heating showed a gain of 24.3% over the same period.

• **Heavy construction** piled up new business at a slower rate in August than in July. Contract awards reported in the week ended August 18 were $322 million, Engineering News-Record and Construction Daily reported. The $325 million weekly average for the first three weeks of August is a sharp drop from the $421 million weekly rate in July. It's better, however, than the $318 million average in August '54, and ahead of any August but '52, when $1.2 billion in AEC contracts swelled the weekly average to $533 million. Contracts awarded so far in '55 total $12.1 billion, up 32% over '54.

WASHINGTON OVERTONES

by LORING OVERMAN

In the rush of adjourning the first session of the 84th Congress, the subject of air-conditioning came in for some enlightening and entertaining mention.

- **First,** newsmen began to wonder whether members of Congress were kidding about wanting to finish their work and hurry home. Noting that both Houses of Congress are coolingly air-conditioned, newsmen pointed out that under such conditions, Washington is more comfortable than many other spots.
- **Next,** government employees in several non-air-conditioned buildings requested permission to install their own air-conditioners. After an exchange of newspaper headlines, permission was granted. Also, the government will not claim title to the unit if the employee wants to remove it. Uncle Sam will also pay maintenance charges and electric bills while the unit operates.
- **Last but not least,** Congressman Broyhill of Virginia introduced RH 7306 to provide that the Administrator of General Services shall conduct an investigation and survey to determine the advisability of providing air-conditioning facilities for all government buildings, as well as for those leased by the Government.

Congressman Broyhill's bill, referred to the House Committee on Government operations, would direct the GSA Administrator to investigate particularly the probable effect on increased efficiency of government workers, reduction of absenteeism, and probable savings to the government.

So again something happens in Washington; the Nation hears the overtones. The Halls of Congress are air-conditioned; the spokesmen for 48 states take home the message that scientifically conditioned air increases efficiency and reduces overhead.

A few blocks from the White House, at headquarters of the Air-Conditioning and Refrigeration Institute, there was evidence of another overtone. Workers attuned to air-conditioning during office hours, are demanding **equal comfort at home.**

- Preliminary sales figures indicated that July was the biggest-ever month for home air-conditioners.
- Pending final retail sales reports, ACRI announced that inventories of room air-conditioners in hands of manufacturers had been reduced by 30% during July.
- ACRI people were wondering whether sales would be boosted materially if Congress had shifted room air-conditioners to the list of home appliances on which only a 5% excise is levied. Present A-C levy is 10%, due principally to an oversight when the law was first passed, and due to difficulty in getting a single item of this kind aboard a fast-moving legislative program.

In the last minute rush to adjourn on August 3, Congress passed a number of measures of interest to Air-Conditioning, Heating and Ventilating folks. Conversely, a lot of things were left undone. But at the second session of the 84th, convening January 3, 1956, Congress will take up right where it left off. All legislative proposals remain in status quo during adjournment.

Important projects not acted upon:

- Proposed Federal Power Commission regulation of natural gas producers; federal aid to highways; federal aid to school construction; health reinsurance, social security changes, and states' rights legislation.

Completed legislation of industrial interest:

- One-year extension of Defense Production Act. Continues authority to expand production capacity of defense industries through materials control, allocation, priorities, and through tax-amortization inducements.

As a condition to renewal of the act, businessmen serving without compensation (WOC's) may act only in advisory capacities and must submit half-year reports of income sources and business holdings.

(*Continued on page* 8)

Metals are the Best Insulators

Against Heat, Cold, and Vapor in Building Spaces

The surfaces of ordinary IRON have about 4 times the reflectivity against heat rays that the surfaces of asbestos, asphalt, paper, brick, plaster, wood and other ordinary building materials have. Brass, gold, silver and ALUMINUM surfaces have about TEN TIMES the reflectivity against heat rays that these non-metallic materials have. Aluminum surfaces, for example, have a 97% reflectivity for RADIATION, whereas the surfaces of most building materials have a reflectivity of only 10%.

RADIATION (heat rays) is responsible for about 65% to 80% of all heat flow sideways in building spaces; 55% to 75% upwards; and 93% downwards.

Air space has low density, therefore heat flow by CONDUCTION through the **spaces** inside building walls, roofs, attics or floors is slight. CONVECTION can account for 15% to 30% of the heat flow sideways in such spaces, and up to 45% upwards. There is NO convection downwards.

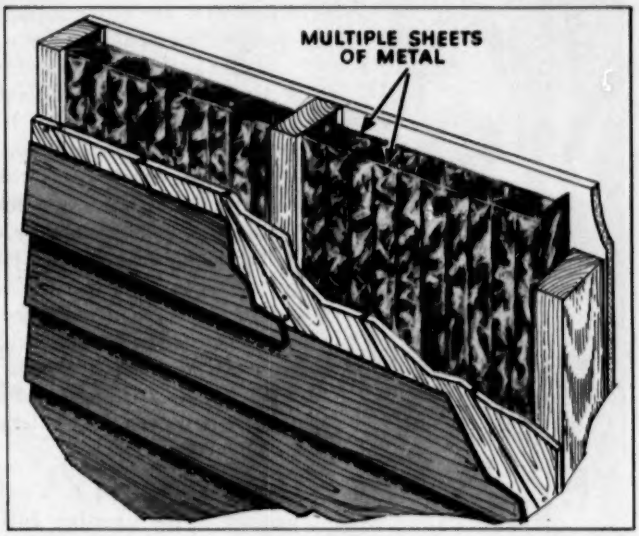
AN EXCELLENT "INSULATING BLANKET"

Multiple sheets of metal, spaced apart, make an excellent barrier to heat and vapor flow in any direction. In Multiple Accordion Aluminum, as it is installed in one simple operation, tough metallic sheets are automatically expanded so as to form alternating layers of aluminum, fiber and low density reflective air spaces. The fibrous and metallic sheets retard inner and outer convection.

Its continuous metal sheets, up to 750 feet long, have almost zero permeability to water vapor. Infiltration under flat stapled flanges is slight. Condensation formation on or within this type of insulation is minimized by its scientific construction. More than 250 million square feet are in use today.

To obtain MAXIMUM, **uniform-depth** protection against heat loss and condensation formation, it is necessary to use the new **edge-to-edge** multiple aluminum*, **each** sheet of which stretches from joist to joist.

*Patent applied for.



FREE! RADIATION TABLE AND ASHAE BOOKLET

A very interesting and useful "Radiation Table" listing the Emissivity, Absorptivity, and Reflectivity of a long list of materials has been prepared by Alexander Schwartz, president of Infra Insulation, Inc. It is yours for the asking.

Also yours for the asking is a discussion of how and why aluminum insulates, even under extreme conditions. It will be found in the booklet, *Thermal Test Coefficients of Aluminum Insulation for Buildings*, published by the American Society of Heating & Air-Conditioning Engineers. A free copy and samples of the new insulation sent by us on request.

COST OF EDGE-TO-EDGE INFRA
Multiple Aluminum Insulation installed in new construction between wood joists, material and labor
Type 6-PS about 10¢ sq. ft.
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WASHINGTON OVERTONES (*Continued from page 6*)

• **Only labor legislation** passed by the 84th raised minimum wage from 75c to $1.00 per hour for employees of firms engaged in interstate commerce. Although 24,000,000 are covered, only two million (most in the South) are affected by the change. Principal changes will involve overtime.

Labor goal at next Congressional session has been announced as increased coverage.

• **Federal debt limitation,** raised temporarily from $275 billion to $281 billion, was extended to June 30, 1956.

• **Contract Renegotiation Act** extended two years to December 31, 1956.

• Congress granted a three-year extension of Presidential authority to negotiate **international trade agreements,** including authority to scale down import duties on selected commodities by not more than 5% a year.

• **Tax legislation** measures passed were not startling. A 52% corporate tax rate scheduled to be reduced 47% on April 1, 1955 was continued for one year. Several excise levies scheduled to be reduced last April were also extended for a year. Two sections of the Revenue Act of 1954 were repealed after much publicity. They dealt with tax treatment for prepaid income and reserves for future expenses.

• Congress extended the **Small Business Administration** as a separate agency for two more years. Legislation also increased maximum loans by SBA from $150,000 to $250,000.

Of direct interest to air-conditioning and heating and ventilating industries was passage of the **housing bill**—signed under protest by the President. The measure:

• Increases mortgage insurance authority of the Federal Housing Administration, and continues for 14 months the Title I Repair and Home Modernizing program of FHA.

• The bill also provides for two new programs dealing with community facilities and trailer parks for small towns, and for 45,000 public housing units in one year. The President objected to the two new programs and considered the **number of housing units inadequate.** For a time after signing, he was said to be considering calling a special session of Congress to reconsider these points, and to enact highway legislation.

Construction industries are proceeding at such a fast pace that Washington is gently applying the brakes:

• One braking action was a **tightening of credit.** New rules require a 2% down payment on GI homes and 7% on most FHA financed units. The braking action is not expected to reduce this year's starts, but may have some affect in 1956.

• In another action, FHA has announced several changes in minimum requirements for property to qualify for FHA financing. The changes were decided upon after several meetings between Neil A. Connor, director of the Agency's Division of Architectural Standards, and the FHA Architectural Standards Advisory Committee. Included were tightened requirements for insulation; increased minimum dimensions for garages; tightened requirements for concrete blocks.

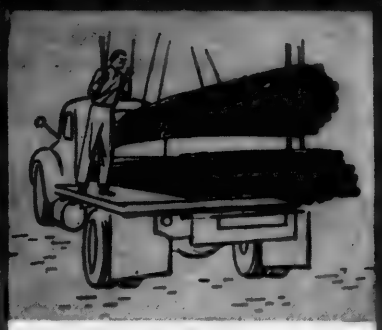
• Several changes were made in requirements for slab-on-ground construction following recommendations made to FHA by the Building Research Advisory Board of the National Academy of Sciences.

Another brake on construction:

Mobilization Director Arthur S. Flemming announced a temporary cutoff of authority to approve for **rapid tax amortization** some $6 billion in proposed defense-related construction. Expansion goals were closed for 19 industries, and suspended for 38 pending further study. Out of 225 industries originally approved for tax amortization under the defense facilities expansion program, only 20 classifications remain open.

• Action followed disclosure that Secretary of the Treasury George M. Humphrey was pressing for a sharp curtailment of the program. He contended the incentive is no longer needed; is costing the country large tax revenues; and is giving some companies unmerited competitive advantages.

• Flemming acted at a time when 924 applications for rapid tax write-offs were pending, involving an estimated $9.3 billion in plan and equipment expansion.



1. Cost of Pipe

The important thing about this cost is that it represents only *one small part* of the piping picture and should not establish the only pipe comparison guide.

2. Cost of Installation

This cost generally represents the *major part of the piping investment* and includes labor, fabrication, valves, fittings, covering, and overhead.

3. Cost of Maintenance

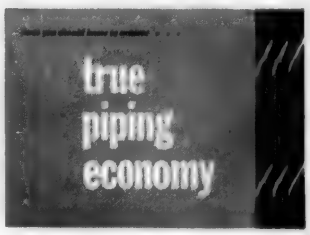
This is the money paid to keep the piping system in operation as long as the need for it exists. The amount spent depends largely on the quality of pipe used.

3 IMPORTANT COSTS THAT SHOW WHY WROUGHT IRON PIPE PROVIDES TRUE PIPING ECONOMY

This breakdown of piping system costs underscores the reasons why wrought iron pipe users enjoy maximum piping economy even though they pay more, *initially*. These users know that they buy an *installed piping system*, not just the pipe. And because the greatest cost of this installed piping system is in labor, valves, fittings, fabrication, covering, and overhead, the difference between the cost of the wrought iron installation and what a low-first-cost pipe installation would have been, shrinks to an insignificant amount in the cost of the *total piping contract*.

But still more important to the plans and pocketbooks of wrought iron pipe users is the Cost of Maintenance. One user put it this way. "A wrought iron installation is like having money in the bank." He was simply expressing wrought iron's longer service in terms of money saved in repairs, replacement, and maintenance. There's no doubt about it . . . when you consider the three costs, you can buy the best—wrought iron—and get a bargain at the same time.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. International Division: New York, N. Y. *Available throughout the world.*



Write for Booklet

The booklet, *True Piping Economy*, gives detailed information on the cost facts presented here, plus many others. You will find it a valuable guide in placing pipe selection emphasis where it will profit you most.

BYERS

CORROSION COSTS YOU MORE THAN WROUGHT IRON

WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY STEEL PRODUCTS

BRIEFLY STATED

• An addition to Famco, Inc., a wholly-owned subsidiary of American Air Filter Company, Inc., will increase the manufacturing area of the plant by 60%. Famco manufactures glass fiber filters for furnaces and air conditioning units and continuous roll media for automatic filters. Expansion of the plant will permit manufacture of additional types of glass fibers for decorative uses and plastic reinforcement.

• The Solid Fuels Conference, will be held at the Neil House, in Columbus, Ohio, October 19-21, 1955. Arrangements have been made jointly by the American Society of Mechanical Engineers and by the American Institute of Mining and Metallurgical Engineers. Elmer R. Kaiser, director of research of ASHAE, is chairman of the Solid Fuels Conference. Co-chairman is William T. Reid of Battelle Memorial Institute administrative staff.

• Dr. Arno C. Fieldner of Washington, D. C., dean of Government research scientists and internationally known authority on coal and related fuels, has retired from the Bureau of Mines, after more than 48 years of outstanding Federal service. Inventor, author, and developer of techniques used worldwide in testing and analyzing coal, coke and gas, Dr. Fieldner holds many awards for scientific achievement in his field. Except for two years spent in directing research for the Army's Chemical Warfare Service during World War I, he has served continuously in the Bureau of Mines since 1910. Born in Ohio in 1881, Dr. Fieldner received his degree in chemical engineering from Ohio State University in 1906. After a brief period in private industry, he joined the Federal Geological Survey at Pittsburgh, Pa., in 1907. He transferred to the Bureau of Mines upon its creation in 1910, and is the Bureau's oldest member in point of service.

• At the annual meeting of the National Association of Fan Manufacturers, Inc., held recently at The Homestead, Hot Springs, Va., the following officers were elected for the ensuing year: C. C. Cheyney, president; R. W. Nelson, vice-president; G. W. McCormick, Jr., secretary-treasurer. Mr. Cheyney is a vice-president of Buffalo Forge Co., and Mr. Nelson is a vice-president of American Air Filter Company, Inc.

• The completion of expanded plant facilities and a broadened sales operation for the Multi-Vent division of the Pyle-National Company, Chicago manufacturer of electrical and air distribution equipment for industry and railroads, have been announced. Multi-Vent's expansion represents the culmination of 10 years of research and production planning. Included in new plant expansion are new production equipment, expanded research facilities and additional warehouse space.

• M. F. Rather, vice president of Johnson Service Company, Milwaukee, manufacturers of automatic temperature control systems, has been elected a director of the company. Mr. Rather is also eastern district and export manager and maintains his headquarters in New York City.

• A three-day institute on air conditioning problems will be held at the University of Wisconsin, Nov. 7-9. The institute, one of 15 scheduled for the fall by Engineering Institutes of the UW Extension Division, will cover theories of air conditioning and refrigeration, instrumentation, air distribution, coil design, duct design, fans, heat load calculations and new developments.

• Loren Fletcher, general manager of the Allied Products Division of Carrier Corp., has been named a vice president. Mr. Fletcher will continue to manage engineering, production and sales for Allied Products Division.

• Warren A. Logelin, former director of public relations for the Chicago Association of Commerce and Industry since 1953, has been named assistant director of public relations for Crane Co. Mr. Logelin previously was director of advertising and assistant director of public relations for the Chicago Transit Authority.

• Harold S. Boxer has been appointed advertising and sales promotion manager of the Fedders-Quigan Corp. Mr. Boxer comes to Fedders from the Television and Radio Division of Westinghouse Electric Corp., Metuchen, N. J. where he has been advertising and sales promotion manager since 1952. From 1945 to 1952 he was employed as the sales manager for the Freed Radio Corporation of New York.

• Heat-Timer Corp. of New York has acquired the controlling stock interest in Standard Instrument Corp., (formerly General Power Plant Co.). Standard Instrument manufactures, among other things, a combustion control device under the registered trade name of "Robot Eye", a line of patented dust and dust concentration analyzers and recorders.

• Walter Sanders, A.I.A., nationally prominent architect and designer, and presently chairman of the Department of Architecture in the College of Architecture and Design, University of Michigan, has been retained by Albert Kahn Associated Architects and Engineers as a consultant on architectural design. A native of Michigan, Mr. Sanders has been associated with the University of Michigan since 1947. After two years as a guest lecturer at the school, following association with Columbia University in a similar capacity, he was made a professor of architecture at the U. of M. in 1949, and in 1954 was elevated to his present post as chairman of the department.

• To speed development of valves and fittings designed for use in nuclear power systems, the Walworth Co. is establishing a new Research and Development Division at Boston. The new division will be independent of the company's regular metals testing and research activities. Dr. Forest C. Monkman, Jr., of Boston, a specialist in metals testing and research and a graduate of the Massachusetts Institute of Technology, has been named to head up the new Walworth research program. He has been the manager of the New England Materials Laboratory of Boston where he had responsibility for metals development and testing programs assigned to the laboratory by a number of national industrial firms.

(*Continued on page* 12)

And in Shreveport – A FUTURE OF FAULTLESS SERVICE

THE HENRY C. BECK BUILDING
Shreveport, Louisiana

NEILD-SOMDAL ASSOCIATES
architects

REG F. TAYLOR
mechanical engineer

JAMES F. O'NEIL COMPANY
plumbing contractor

CRANE CO.
wholesale distributor and plumbing fixtures manufacturer

Proudly symbolic of the growth of Shreveport as a southern hub of the oil, gas, and chemical industries this twenty story COYNE & DELANY installation, now under construction, will be a landmark on the skyline for miles around. From the brightly blue aluminum and glass "skin" to the fine details of interior mechanical equipment, emphasis in the design of the Beck Building was placed on the "newest and the finest." In pace with the spirit of such a structure was the worthy selection of COYNE & DELANY Flush Valves.

Seventy six years of valve making experience plus a determination to maintain leadership in product design has made DELANY – "the fastest growing name in flush valves."

This new "HAND BOOK and CATALOG No. 53" is the most comprehensive of its kind—designed for everyday reference . . . 19 pages of installation details for exposed, concealed and special FLUSH VALVE installations . . . over 75 blue prints . . . cut away views . . . many pages of charts, formulae, piping details . . . sent free, if requested on firm letterhead.

COYNE & DELANY CO. • 834 KENT AVE. • BROOKLYN, NEW YORK

IN CANADA: THE JAMES ROBERTSON CO., LTD.

DELANY *Flush* VALVES

Since 1879

BRIEFLY STATED

(*Continued from page* 10)

• Plans for a $2,500,000 improvement program at the Union Foundry, of the Alabama Pipe, Anniston, Ala., were announced recently. The work there is part of an extensive program of improvements in the company's manufacture of cast iron soil pipe and fittings. Concurrently with the foundation work on a new $400,000 building, work will be started on foundations for centrifugal pipe casting equipment, a second step in a program started in 1948 by Alabama Pipe to cast all pipe products by the centrifugal method. When these units go into production in 1956, the Alabama Pipe Co. will be producing all sizes of cast iron soil pipe by the centrifugal process.

• The board of directors of the Gas Appliance Manufacturers Association has announced the formation of a new division—the Gas Unit Heater & Duct Furnace Division. Originally, the division was known as the Gas Unit Heater Group. Chairman of the new division is David R. Webster, president of Reznor Manufacturing Company of Mercer, Pa.

• A trade school course in commercial-industrial oil burning and equipment, comprising two years of classroom and practice training is offered, beginning Wednesday after Labor day, by Springfield Trade School, Springfield, Mass., to students who have had three years of high school or equivalent. Course includes basic general subjects in addition to technical instruction in fuels, combustion, furnaces, burners, controls and servicing as outlined by Oil Heat Institute.

• Trion, Inc., has appointed Robert H. Maloy as advertising and sales promotion manager. He replaces Richard E. Sweitzer who was promoted to assistant sales manager. Mr. Maloy was formerly with the Insul-Mastic Corp. of America.

• Tywel Manufacturing Corp., Brooklyn, makers of built-in wall air conditioning units, has changed its name to the Lewyt Air Conditioner Corp.

• W. C. Robinson has been appointed an assistant sales manager of Tube Turns, Louisville, Ky. Mr. Robinson was born in Marietta, Ohio, and received his B.S. in commerce at Ohio State University. He was associated with the Robert H. Clark Company, manufacturers of hydraulic tools for the aircraft industry, before joining Tube Turns in 1944 as a sales representative in the company's Pittsburgh office.

• Edmund Claxton, director of research for the Armstrong Cork Co., is the new president of the Building Research Institute. He succeeds Fred M. Hauserman, who was the second Institute president. The new vice president is William Muirhead, president of William Muirhead Construction Co. of Durham, North Carolina (Associated General Contractors of America). William H. Scheick continues as executive director. Terms of office are from July 1, 1955 to June 30, 1956.

• An option on a 68-acre tract of land, eighteen miles east of downtown Los Angeles, has been taken by Carrier Corporation, the nation's largest manufacturer of air conditioning equipment. Carrier is now laying plans to concentrate its West Coast manufacturing operations in buildings to be erected on the property.

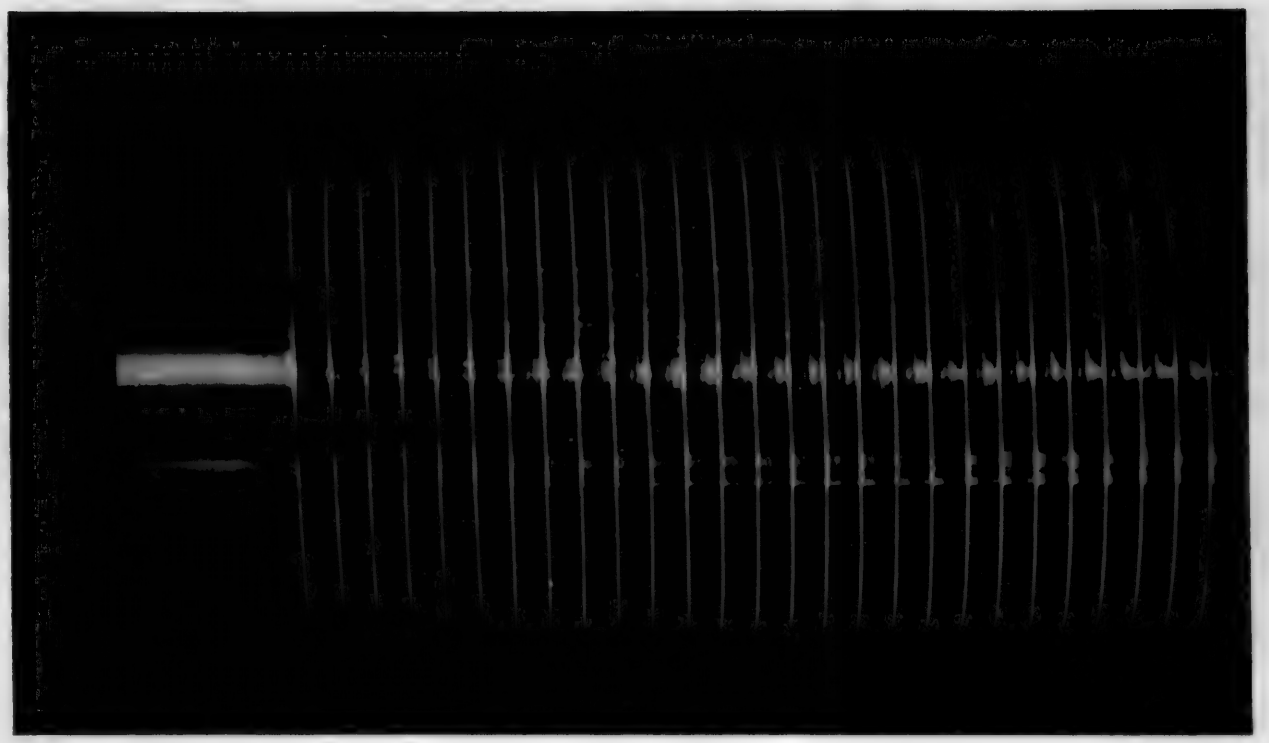
• A new semi-hermetic compressor warranty program, announced by The Brunner Company of Gainesville, Ga., offers a full five-year warranty on a complete compressor line. Under this program, 157 wholesalers, in 134 cities have agreed to act as parts depots in connection with the program. Owners of Brunner condensing units, whether covered by a Brunner warranty or by the warranty of a fixture manufacturer, may make parts exchanges with any one of the 157 wholesalers. To the fixture manufacturer, this new program means he need carry no Brunner parts stock or handle any replacement transactions. Also the new program is flexible to permit the fixture manufacturer to use either his own warranty program or the Brunner program. In either case the fixture manufacturer uses the signed-up Brunner wholesaler organization.

• Nuclear power production and the construction of high temperature-high pressure plants will highlight the 18th annual American Power conference at the Hotel Sherman, Chicago, March 21-23. Conference director is Roland A. Budenholzer, professor of mechanical engineering at Illinois Tech.

• The Westinghouse Electric Corp., has offered to purchase the assets of the C. A. Olsen Manufacturing Co., Elyria, Ohio, producer of residential furnaces. The announcement of this offer was made on August 17. A formal contract is in preparation. The purchase has been approved by the Westinghouse board of directors, the directors of the Olsen Company, and is now subject to the approval of the Olsen Company stockholders at a special meeting to be held in early September. If the Olsen stockholders approve the sale, Mr. C. A. Olsen will become president of a newly formed, wholly owned subsidiary of Westinghouse. The Olsen Company name will be continued, as will the firm's trade names—Luxaire and Moncrief—and no changes are contemplated in the personnel or operating policies of the organization.

• York Corporation president, Stewart E. Lauer, made the following statement concerning the agreement by Westinghouse to purchase the assets of C. A. Olsen Manufacturing Co.: C. A. Olsen, chairman and president of C. A. Olsen Manufacturing Company, with the approval of Westinghouse, has assured us that they have no intention of discontinuing the manufacture and sale of combination heating-cooling units to us as long as we desire to purchase them. And, he also advised that they plan to continue to purchase cooling circuits from us and we have agreed that we will furnish these circuits.

• In an expansion move Iron Fireman Manufacturing Company will construct a $900,000 manufacturing plant at Ligonier, Indiana. Iron Fireman currently operates five manufacturing plants in the United States and Canada. Bids have been asked for a one-story, expandable concrete block and brick faced structure encompassing 132,000 square feet of factory space. Present schedules call for completion in early 1956.



AEROFIN
Smooth-Fin Coils offer you

Greater Heat Transfer
per sq. ft. of face area

Lower Airway Resistance
—less power per c.f.m.

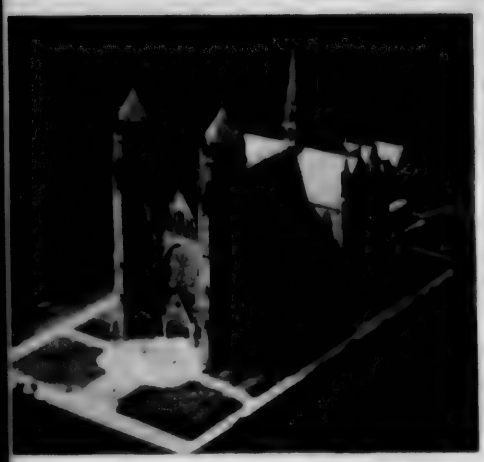
Aerofin smooth fins can be spaced as closely as 14 per inch with low air friction. Consequently, the heat-exchange capacity per square foot of face area is extremely high, and the use of high air velocities entirely practical. Tapered fin construction provides ample tube-contact surface so that the entire fin becomes effective transfer surface. Standardized encased units arranged for simple, quick, economical installation.

Write for Bulletin S-55

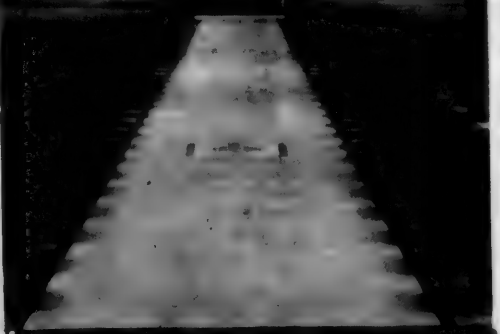
AEROFIN CORPORATION

101 Greenway Ave., Syracuse 3, N. Y.

Aerofin is sold only by manufacturers of fan system apparatus. List on request.



Airview of SACRED HEART CATHEDRAL showing cruciform design.



SACRED HEART CATHEDRAL

NEWARK, N. J.

Formal Opening October 1954

Architect
PAUL C. REILLY, New York City

Mechanical Engineers
SEARS and KOPF
ABRAHAM WALTON, New York

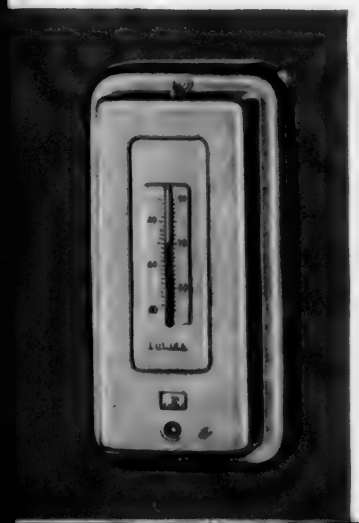
Mechanical Contractor
FRANK A. McBRIDE CO.,
Patterson, New Jersey

Altar crucifix is life size carved from flesh colored onyx.

Traditional and modern religious buildings both require the greater comfort, fuel economy and dependable performance of

POWERS

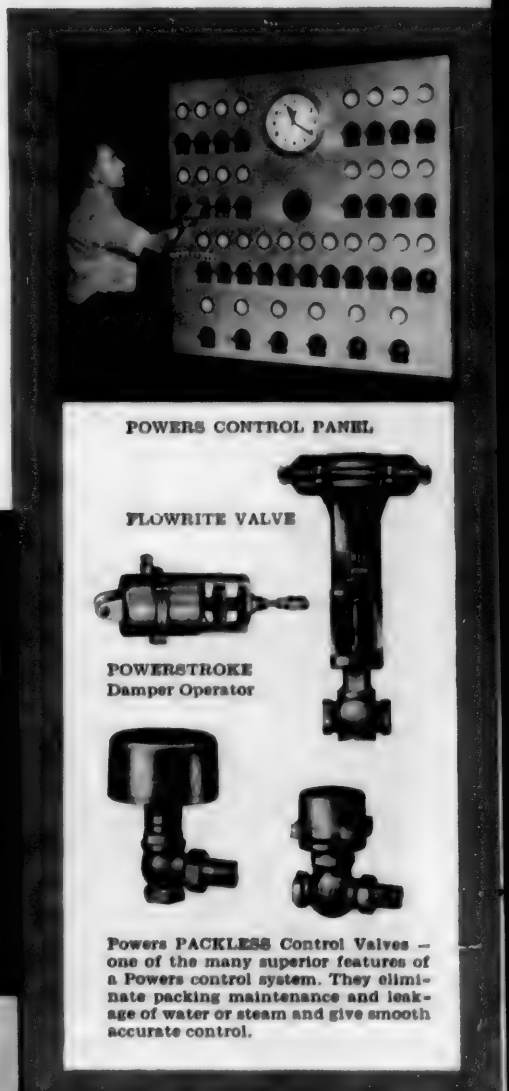
AUTOMATIC SYSTEMS OF
Temperature Control



SACRED HEART CATHEDRAL in Newark, New Jersey — a masterpiece of French-Gothic architecture — is one of many distinguished churches and synagogues controlled by Powers.

Here thermal comfort and fuel economy will be assured by the traditional dependability of Powers automatic control regulating the heating and ventilating system throughout the church and rectory. Panel heating system for snow melting installed in the paved plaza leading to the main entrance of the church also is Powers controlled.

Experience gained by Powers, in this and other monumental buildings in the past 60 years, should be helpful to you in selecting the most efficient control for your building . . . regardless of type or size. For further information contact our nearest office or write us direct.

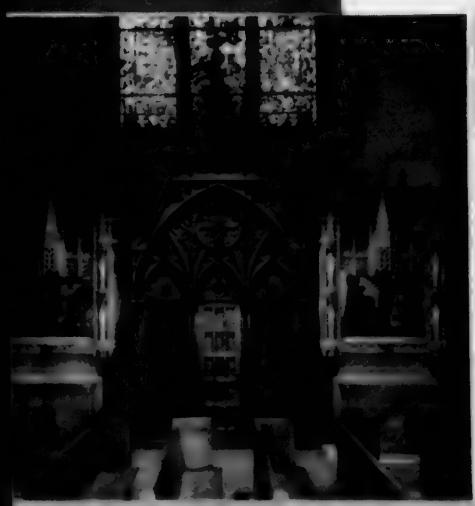


POWERS CONTROL PANEL

FLOWRITE VALVE

POWERSTROKE
Damper Operator

Powers PACKLESS Control Valves — one of the many superior features of a Powers control system. They eliminate packing maintenance and leakage of water or steam and give smooth accurate control.



Confessionals of hand carved white oak flanked by mosaic stations of the cross.

View from altar looking toward rose window over main entrance.

THE POWERS REGULATOR COMPANY

SKOKIE, ILLINOIS | *Offices in chief cities in U.S.A., Canada and Mexico*

Established in 1891 • Over 60 years of Automatic Temperature and Humidity Control

(197)

Clean Air by the

The magic ROLL-O-MATIC!

Front view of automatic self-cleaning air filter consisting of two 5′0″ wide by 8′0″ high sections having a total capacity of 26,700 cfm. The renewable media filtering curtain, mounted in roll form at top of each section, moves down the face of the filter and is re-rolled at bottom.

AAF
herman nelson

YOUR MAINTENANCE MAN IS A MOTOR!

Controlled by an automatic time switch, this single motor supplies the power for both introducing sufficient clean media to maintain desired operating resistance and for re-winding the dirt laden material.

READY TO ROLL!

Free end of fiber glass filtering curtain is attached to driven spool at bottom of filter which re-rolls the used material for later disposal. Note thickness of material in the filter curtain.

A YEAR'S SUPPLY OF CLEAN AIR!

Pictured is a standard 70 ft. length of filtering material for a 5 ft. wide ROLL-O-MATIC section. When rolled on spool, it forms a compact, easy-to-handle package only 13″ in diameter.

B E T T E R A I R I S O U R

ROLL!

Roll-O-MATIC

writes a new chapter in maintenance-free, low cost air filter operation

Once-a-year air filter maintenance is no longer a "dream". ROLL-O-MATIC makes it a reality with the renewable media filtering curtain supplied in roll form.

This is no ordinary filtering curtain. It's a "blanket" of bonded glass fibers possessing the high cleaning efficiency, dust holding capacity and velocity rating of a viscous filtering media. But, unlike such media, it is sufficiently resilient and flexible to permit packaging 70 ft. lengths in compact 13" diameter rolls.

Equipped with this versatile media, ROLL-O-MATICS are setting new high standards for maintenance-free operation—a fact verified by field reports which indicate that a single roll of this low cost material represents a *year's supply* per 18,000 cfm capacity under normal operating conditions. This means that, in addition to the man-hours saved through reduced maintenance, ROLL-O-MATICS are operating at less than half the cost of disposable type filters of equal capacity.

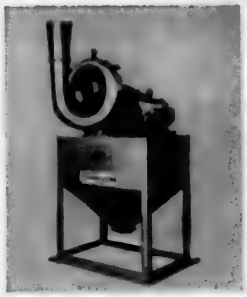
"Clean air by the roll" is the most significant air filter development of the past decade. For complete technical data on the ROLL-O-MATIC, call your local AAF representative, now, or write for Bulletin No. 248.

American Air Filter
COMPANY, INC.

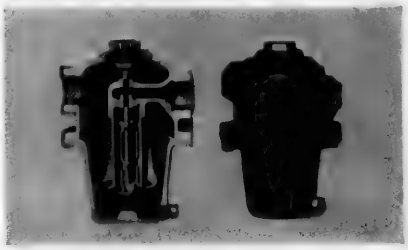
294 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

B U S I N E S S

OTHER AAF PRODUCTS

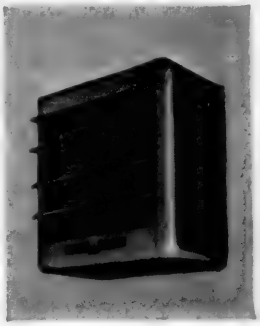


AAF Type D ROTO-CLONE—designed for the dry collection of granular dust. One of five basic types in AAF's complete line of dust control equipment. Ask for Bulletin 270.



illinois Float and Thermostatic Traps—made in three series for operating ranges from 50 pounds pressure to 25 inches vacuum. Ask for Bulletin 27.

herman nelson propeller-fan type unit heaters for use with steam, hot water or gas. Ask for Bulletins 700 and 715.



American Air Filter Company, Inc.
294 Central Avenue, Louisville 8, Ky.

I would appreciate receiving catalogs describing the following equipment—

- ☐ *Roll-O-MATIC* Air Filters (248)
- ☐ **ROTO-CLONE** Dust Control Units (270)
- ☐ **illinois** Traps (27)
- ☐ *herman nelson* Unit Heaters (700-715)

Name_____

Company_____

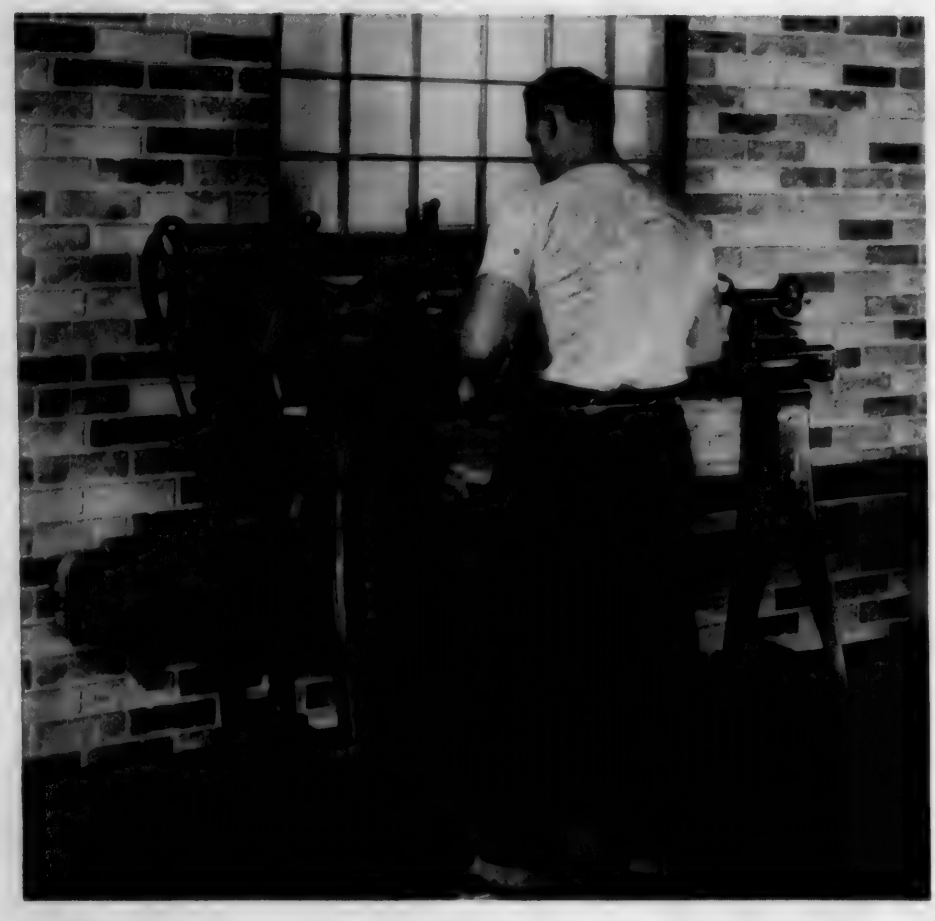
Street_____

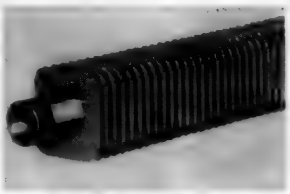
City_____ State_____

TEMTRIM Finned Tube Radiation

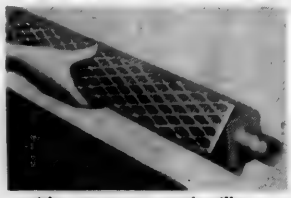
by American-Standard

high output . . . low cost . . . easy installation

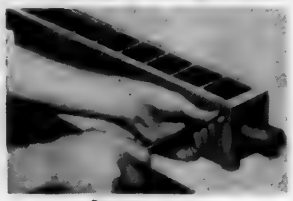




You can install Temtrim with fins exposed . . .



with a snap-on metal grille . . .



a flat top cover or . . .

a sloping top enclosure.

HANG THEM HIGH OR LOW, Temtrim Finned Tube Radiation Units project only 5" into the room—don't steal valuable floor space. They're truly compact, yet they make up one of the most efficient types of radiation ever built.

Temtrim is low in cost and easy to install. It can be quickly connected and hung on the wall. Temtrim is fine for buildings old and new, where hot water or steam systems are used.

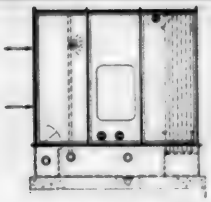
Fabricated from steel pressure tubing, Temtrim can be installed with fins exposed or with one of three attractive covers: snap-on metal grille, flat top cover, sloping top enclosure. Temtrim comes in two tube sizes to meet any heating requirement and convenient lengths of 2 to 12 feet, in one-foot increments.

For more information about Temtrim Finned Tube Radiation for industrial, public and commercial buildings, see your local American-Standard distributor or write to the Plumbing and Heating Division, American Radiator & Standard Sanitary Corporation, P. O. Box 1226, Pittsburgh 30, Pennsylvania.

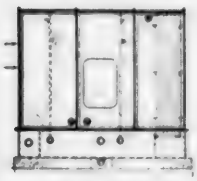
AMERICAN-Standard

HOT WATER HEAT

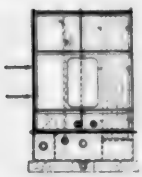
6 AIR WASHERS
—and what they can do for you



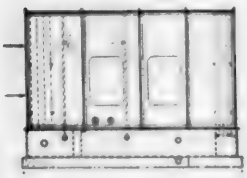
"Buffalo" TYPE A — HUMIDIFYING AND AIR CLEANING. In this efficient, highly practical unit, air flows thru a dense curtain of atomized spray, into a large space for thorough mixing of air and spray, then thru wetted-down corrugated eliminator plates — cleaned, cooled and humidified. Resistance is only ¼" static.



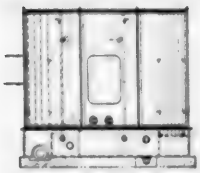
"Buffalo" TYPE B — DEHUMIDIFYING AND AIR CLEANING. Using the same flooded eliminator plate and tank construction as the Type A Washer, Type B has two banks of sprays in a 95" long chamber. Either or both banks can be shut off to regulate humidity in summer. Available also as a spray dehumidifier.



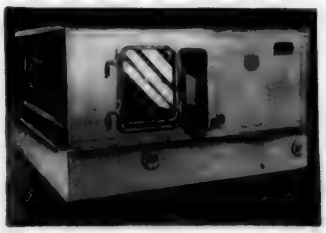
"Buffalo" TYPE C — HUMIDIFYING AND AIR CLEANING IN RESTRICTED SPACE. For ventilating systems where the best possible air washing, cooling and cleaning at least expense is desired, this design gives excellent results. Having a shorter (56") spray chamber and a single bank of sprays, it has the same removable eliminator plates with five corrugations as Types A and B.



"Buffalo" TYPE H — HIGH EFFICIENCY HUMIDIFYING WITH MINIMUM PUMP POWER. Their two banks of sprays operate with as little as 37 lbs. pressure on the spray headers. Type H is particularly suited to humidifying problems requiring large volumes of air, as in textile mills.



"Buffalo" TYPE T — DEHUMIDIFYING AND HUMIDIFYING. Providing efficient cooling and humidity control by spraying chilled water, this space-saving design is widely used for industrial air processing as well as comfort cooling in public buildings.



"Buffalo" WET GLASS CELL AIR WASHERS FOR DUST-FREE CONDITIONED AIR. These units combine "Buffalo" Air Washer features with sprayed glass filament filter cells — not only providing humidity control and cooling, but practically eliminating airborne dust.

REQUEST BULLETINS 3142-E, AC 320 and 3457 for DETAILS ON THIS COMPLETE, TIME-PROVED LINE!

BUFFALO FORGE COMPANY "Buffalo"

WON'T LEAK!

Joints of Chase® Copper Water Tube and Chase® Solder-Joint Fittings mean a radiant heating job that lasts longer!

Because they're strong *solder joints*, the connections you make with Chase Copper Solder-Joint Fittings stay leak-proof *for good!*

And because Chase Copper Water Tube comes in long lengths of 60 to 100 feet, *fewer* fittings are required, installation is faster and easier!

Together, Chase Copper Water Tube and Chase Solder-Joint Fittings mean a *quality* radiant heating installation that will protect your reputation for good work! Both are available from your Chase Wholesaler.

Chase®

BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

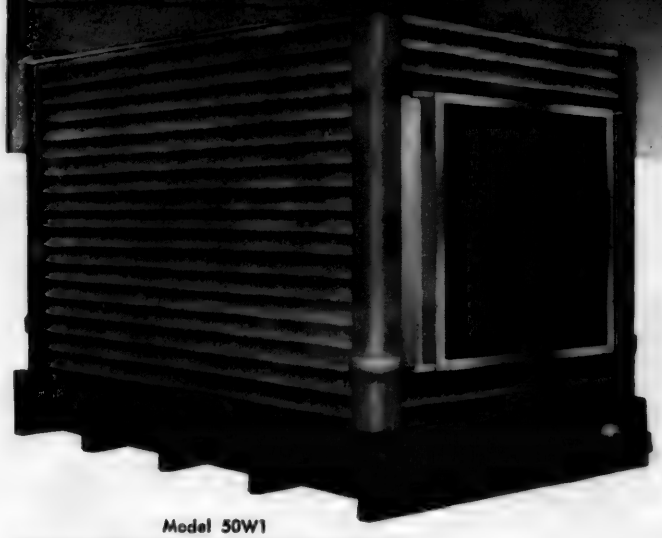
The Nation's Headquarters for Brass & Copper

(†sales office only)

Albany†	Chicago	Detroit	Los Angeles	New Orleans	Rochester†
Atlanta	Cincinnati	Grand Rapids†	Louisville†	New York	St. Louis
Baltimore	Cleveland	Houston	Milwaukee	Philadelphia	San Francisco
Boston	Dallas	Indianapolis	Minneapolis	Pittsburgh	Seattle
Charlotte†	Denver	Kansas City, Mo.	Newark	Providence	Waterbury

NEW

for longer life when the going is tough



Model 50W1
Job Assembled--Asbestos Cement Board Casing

Marley offers a new series of cooling towers specifically designed to combat corrosive atmosphere and water . . . to "go the full distance" under the most rigorous operating conditions.

All-redwood structure and heavy asbestos cement board or wood casing—both impervious to corrosion—are a positive guarantee of prolonged service life. In the Marley forced draft design the fan and mechanical equipment have the advantage of being out of the discharge air stream.

But regardless of your climate, there will be times when you'll specify these new towers because of their attractive appearance and their unique adaptability to almost any location. Because air discharge is vertical, wind direction is not a factor in locating Forced Draft Wood Aquatowers. Smaller models are factory assembled and the larger models can be hoisted on standard freight elevators because they are shipped disassembled.

New Forced Draft Wood Aquatowers are available in 10 models for services from 3 to 50 tons. Ask your nearby Marley Sales Engineer for a copy of Bulletin FDWA or write direct to Marley, world's leading producer of water cooling towers for air conditioning and refrigeration.

U. S. Patent Pending; patents granted in Great Britain, France, Belgium, Italy, Australia, Mexico, Switzerland, Union of South Africa.

Model 5W2
Pre-assembled--wood casing

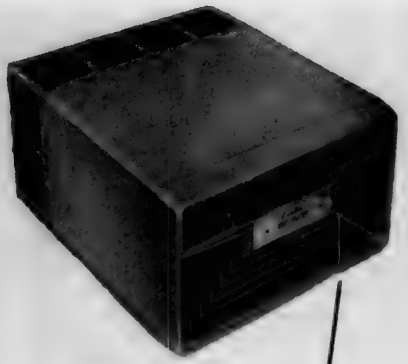
"Nothing cools as well as water . . .
Nothing cools water as well as a Marley Cooling Tower"

MARLEY

The Marley Company

*Trademark Reg.

Kansas City, Missouri



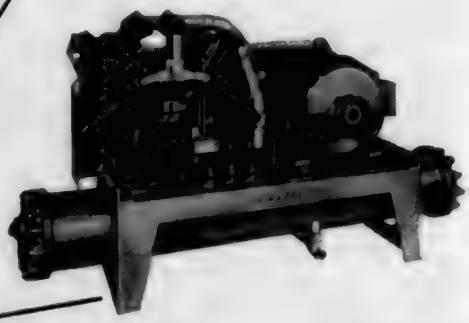
Window Air Conditioners

More jobs... More profit!

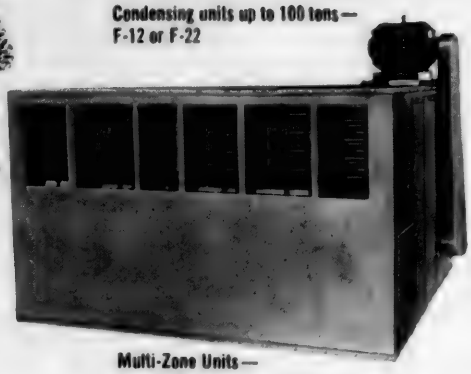
WITH THIS

complete Curtis LINE

Packaged Air Conditioning units—2 to 20 tons

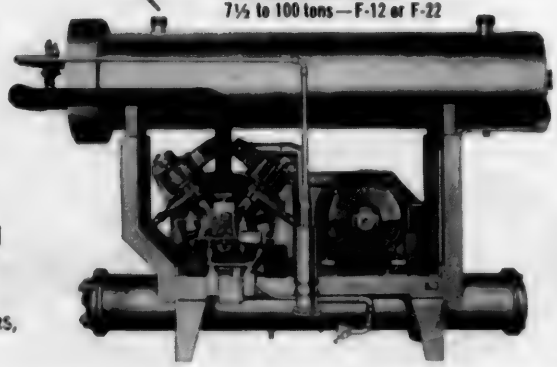


Condensing units up to 100 tons—F-12 or F-22



Multi-Zone Units—serving 2 to 8 zones

Packaged Liquid Chillers—7½ to 100 tons—F-12 or F-22



You'll sell more jobs, and make more profit, with this well-rounded Curtis line. Curtis equipment sells readily because it is backed by one of the oldest and most respected names in the business. Curtis products are presold for you by hard-hitting national advertising in *Saturday Evening Post, Time and Newsweek*, plus many national business and trade magazines.

WRITE TODAY for information on how you can obtain a Curtis direct factory franchise.

Curtis REFRIGERATING MACHINE DIVISION
of Curtis Manufacturing Company
1999 Kienlen Avenue, St. Louis 20, Missouri

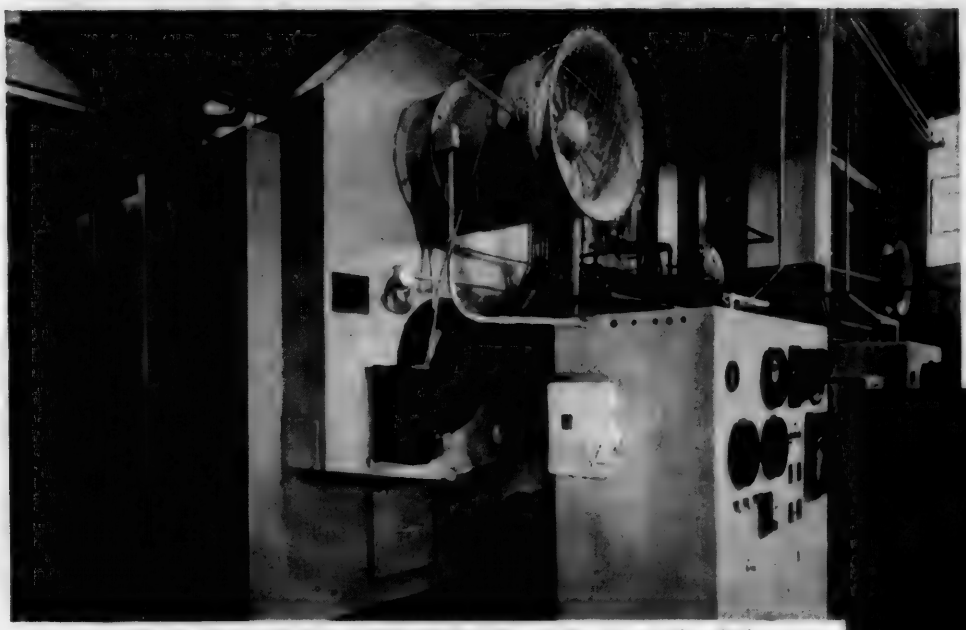
Other Curtis Products: INDUSTRIAL AND AUTOMOTIVE AIR COMPRESSORS, AUTO LIFTS, CAR WASHERS, AIR HOISTS

829

keeping steam cheap...

2 B&W FM Boilers Provide All Steam For New

Barberton Citizens Hospital



Dual unit installation of B&W FM Boilers in Barberton Hospital

Consulting Engineers:
William E. Bodenstein and W. W. Shuster

Architects:
Samuel Hannaford & Sons

Heating, Ventilating, Plumbing:
T. O. Murphy Company

HEATING

HOT WATER

STERILIZERS

KITCHENS

LAUNDRY

Air view of new Barberton Citizens Hospital

The opening of the new 251-bed Barberton Citizens Hospital in Barberton, Ohio, was the proud climax of an intensive ten-year community effort. Incorporating many original ideas as well as design features proved in other modern hospitals, the building and its facilities are as advanced as research and progressive design could make them. Virtually a small city, Citizens Hospital has its own pharmaceutical center, drug store, gift shop, power plant, accounting office, a restaurant capable of serving 37,000 meals a month, and a laundry that can handle 13½ pounds of linen per patient, per day.

Aware of the importance of assuring a reliable and economical steam supply that will fully meet the demanding requirements of hospital service, Barberton Citizens Hospital installed two B&W Integral-Furnace Boilers, Type FM, to meet all steam requirements. The boilers are gas-fired with provision made for using oil as stand-by fuel. The units are automatically controlled to operate under minimum supervision. They have a combined capacity of 41,000 lb of steam per hr, sufficient to supply an additional patient wing if one is built in the future. The present building has a total of 560 rooms for all purposes. The FM Boilers are easily providing all the steam needed for heating, hot water, restaurant, laundry, and sterilizing requirements.

Like this new hospital, many other institutions as well as commercial and industrial users have found the compact, shop-assembled FM Boiler ideal for small to medium steam loads. It is available in standard sizes for loads to 40,000 lb of steam per hr at pressures to 235 psi—may be obtained for higher pressures and with moderate superheat. Get the advantages of this versatile, economical unit if you are planning new construction, modernization, or expansion of your existing steam facilities.

For a detailed, illustrated description of the B&W FM Boiler write for Bulletin G-76A. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

COST-SAVING FEATURES of the B&W Type FM Boiler

- Saves Erection Time and Cost
- Meets Wide Range of Service
- Handles Quick Load Changes
- Fast Steaming
- Low Maintenance
- Easy Accessibility
- Suitable for Outdoor Service
- Burns Oil and/or Gas
- Saves Fuel
- Saves Space
- Safe, Automatic Operation

BABCOCK & WILCOX

BOILER DIVISION

G-709

Random Thoughts from a Filter Engineer

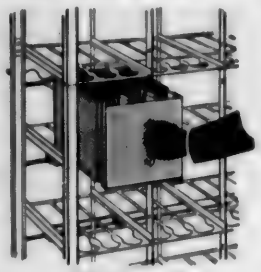
by Charles Meyer

- **HOW DO YOU FIGURE THE COST OF ELECTRONIC FILTERS?**
- **HOW TO IMPROVE ON A VOLTMETER**
- **EXTRAS THAT ADD UP TO A LOT**

HOW DO YOU FIGURE THE COST OF ELECTRONIC FILTERS?

If you just look at the delivered net price, you're overlooking an important fact. The total price must include the erection or installation cost and the owner pays for this, whether or not he realizes it.

Take the case of our Electromaze—the electronic filter that removes dirt particles down to 1/50 of a micron. The unit selling price won't stampede purchasing agents because it is comparable with other makes. But if these purchasing agents figure the cost of installation, they'll find a big saving—as much as one-half the cost of installing other types. That's because of the special "building block" design of the Electromaze. Each cell is a complete, self-contained electric filter. There are no separate hinges or ionizing sections to install. Each section of cells is quickly attached to other sections so the complete job is finished in a hurry. And because these sections are lighter, they are easier to handle and with less chance of damage.



Electromaze

So when you figure the cost of an electronic filter, make sure you add installation costs to the delivered net price. Then you'll have the *true* cost of the filter.

HOW TO IMPROVE ON A VOLTMETER

Almost everyone wants equipment that's easy to use. That goes for the manufacturer as well as the customer. A good example of this trend toward simplicity is the Cadillac. Some years ago it had a voltmeter to indicate if the generator was charging the battery. Now it has a red light which glows if the generator is *not* charging.

We accomplished a similar feat with our Electromaze. It doesn't have a voltmeter, either. Because we've found a simpler way to tell a maintenance man if the equipment is operating properly.

We've replaced the voltmeter with a signal light. If it's on, a maintenance man can tell at a glance that the Electromaze is operating within safe limits. If it's off, he immediately knows something is wrong. Think how much simpler this is than looking at a meter and interpreting the readings. And how much less chance there is of mistakes.

EXTRAS THAT ADD UP TO A LOT

Most of the well-known electronic air cleaners are similar in principle. And all of them have the same function—to remove the finest particles of dust. They're even priced about the same. To find out which gives you the most value, it pays you to look beyond the surface for the little extras that can mean a lot.

Our Electromaze has extra engineering features including:

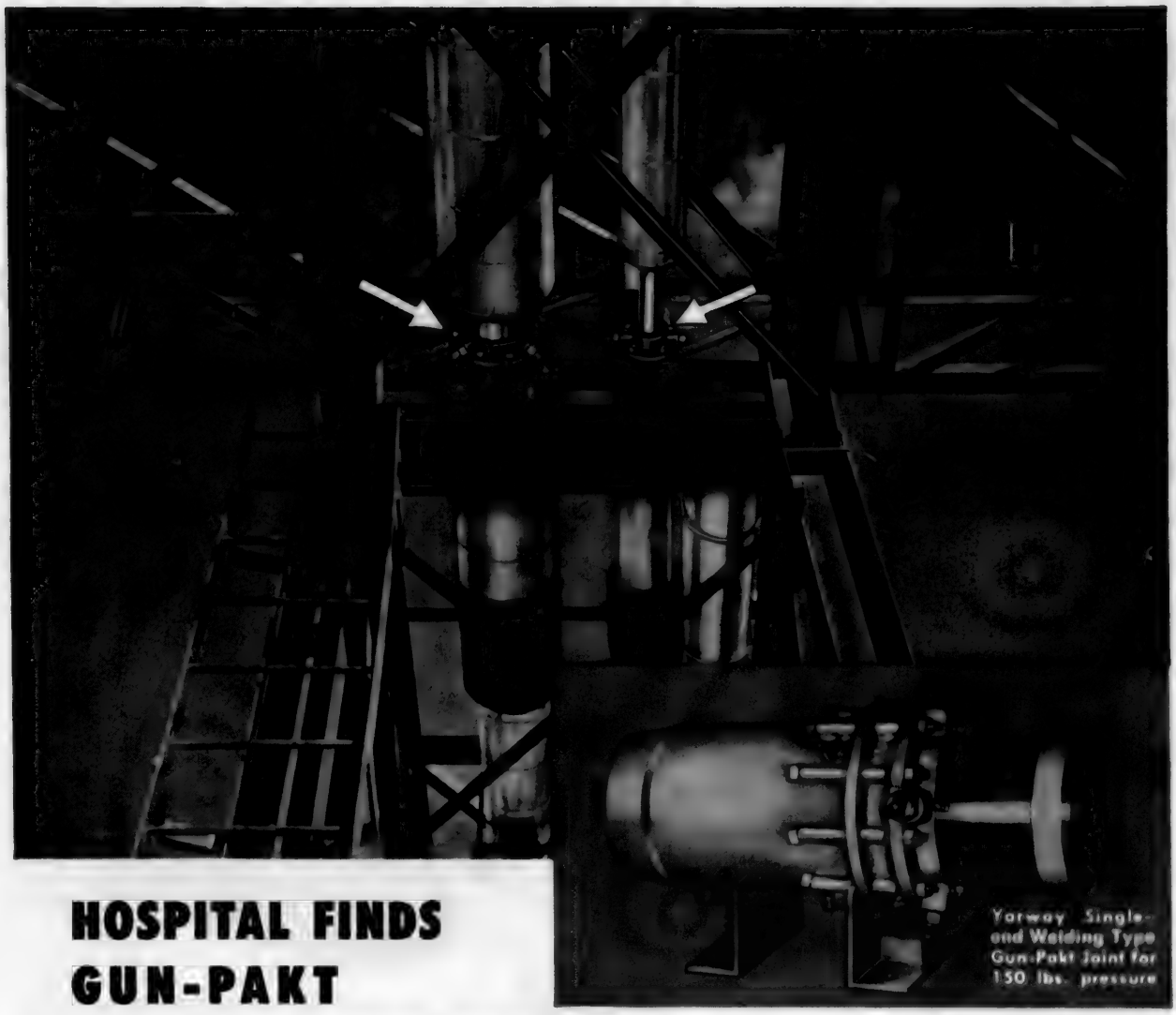
1. Selenium type rectifier to eliminate tube replacement
2. Silicone coated insulators that repel moisture, help prevent shorts
3. Etched aluminum plate that provides a better surface for retention of adhesive
4. Iridyte-coated cells for extra protection against corrosion
5. Built-in diffuser plate in front of each cell for better air distribution
6. Integral ionizing wire and bracket assembly that can be replaced in seconds.

Any one of these extras taken separately is important. When you put all of them together, they add up to a big plus value for Electromaze. The Air-Maze Corp., 25000 Miles Road, Cleveland 28, Ohio.

AIR-MAZE

The Filter Engineers

AIR FILTERS • SILENCERS • SPARK ARRESTERS
LIQUID FILTERS • OIL SEPARATORS • GREASE FILTERS



HOSPITAL FINDS GUN-PAKT *SURE CURE FOR EXPANSION JOINT TROUBLES*

YARWAY Gun-Pakt Expansion Joints are just what the "doctor" ordered for this overhead steam line at a large southern hospital—and he ordered 22 of them!

In institutions, industrial plants and other large steam distributor systems YARWAY Gun-Pakt Joints are growing in popularity.

YARWAY Gun-Pakt slip-type joints give long life—no fatigue failures.

You need *fewer joints per length of line*, with traverses up to 12" single and 24" double.

Gun-Pakt joints are *repacked under full steam pressure right on the job—no unpacking, no shutdowns.*

There's also *lower pressure load on end anchors* because excessive strains are eliminated.

All these are reasons why it will pay you to "do as the doctor ordered"—look into YARWAY Gun-Pakt Expansion Joints. Write for Bulletin EJ-1914.

YARNALL-WARING COMPANY
104 Mermaid Avenue, Philadelphia 18, Pa.
Branch Offices in Principal Cities

GUN-PAKT EXPANSION JOINTS

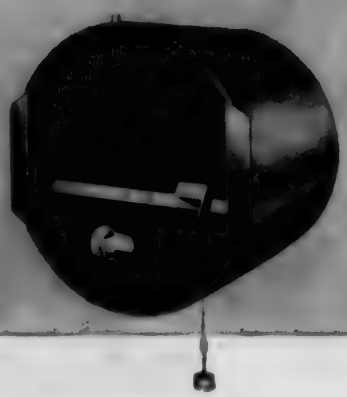
DEPENDABLE,

PRECISELY ACCURATE

Draft Control

for coal fired, oil fired, gas fired or gas-oil fired

HEATING PLANTS



FIELD TYPE "M" for coal and oil fired heating plants

Heavy duty commercial model in 28" and 32" sizes. Heavy, rigid construction assures long, trouble free service. Stainless steel knife edge bearing for permanent sensitivity. Also available in 6" through 24" sizes for domestic and commercial installations. First choice of heating men — the round control you can level on any flue.

FIELD TYPE "MG" for gas and gas-oil fired heating plants

A heavy duty, precision built control in sizes 8" through 32" for commercial and industrial installations. Stainless steel knife edge bearings for permanent sensitivity. Gate opens inward to regulate updrafts, and outward to relieve down-drafts. Optional safety switch available where codes require. Fully proven, accepted virtually everywhere.

They're real HEAVYWEIGHTS

Compare the weight of a Field Control to any other available. Here is proof of the massive, welded construction, long, vibration-free service, that permits Field's supreme accuracy.

Size Control	Gate	Thickness of Parts Side Plates	Ring	Collar	Wt. without Crtn. or Crate
14 M	16 Ga.	16 Ga.	⅜ x 2"	22 Ga. Galv.	19#
16 M&MG	16 Ga.	16 Ga.	⅜ x 2"	18 Ga. Galv.	28#
18 M	16 Ga.	16 Ga.	⅜ x 2"	18 Ga. Galv.	35#
20 M&MG	16 Ga.	16 Ga.	½ x 2"	18 Ga. Galv.	41#
24 M&MG	14 Ga.	16 Ga.	½ x 2"	18 Ga. Galv.	65#
28 M&MG	14 Ga.	14 Ga.	¾ x 4"	14 Ga. H.R.S.	110#
32 M&MG	14 Ga.	14 Ga.	¾ x 4"	14 Ga. H.R.S.	140#

field

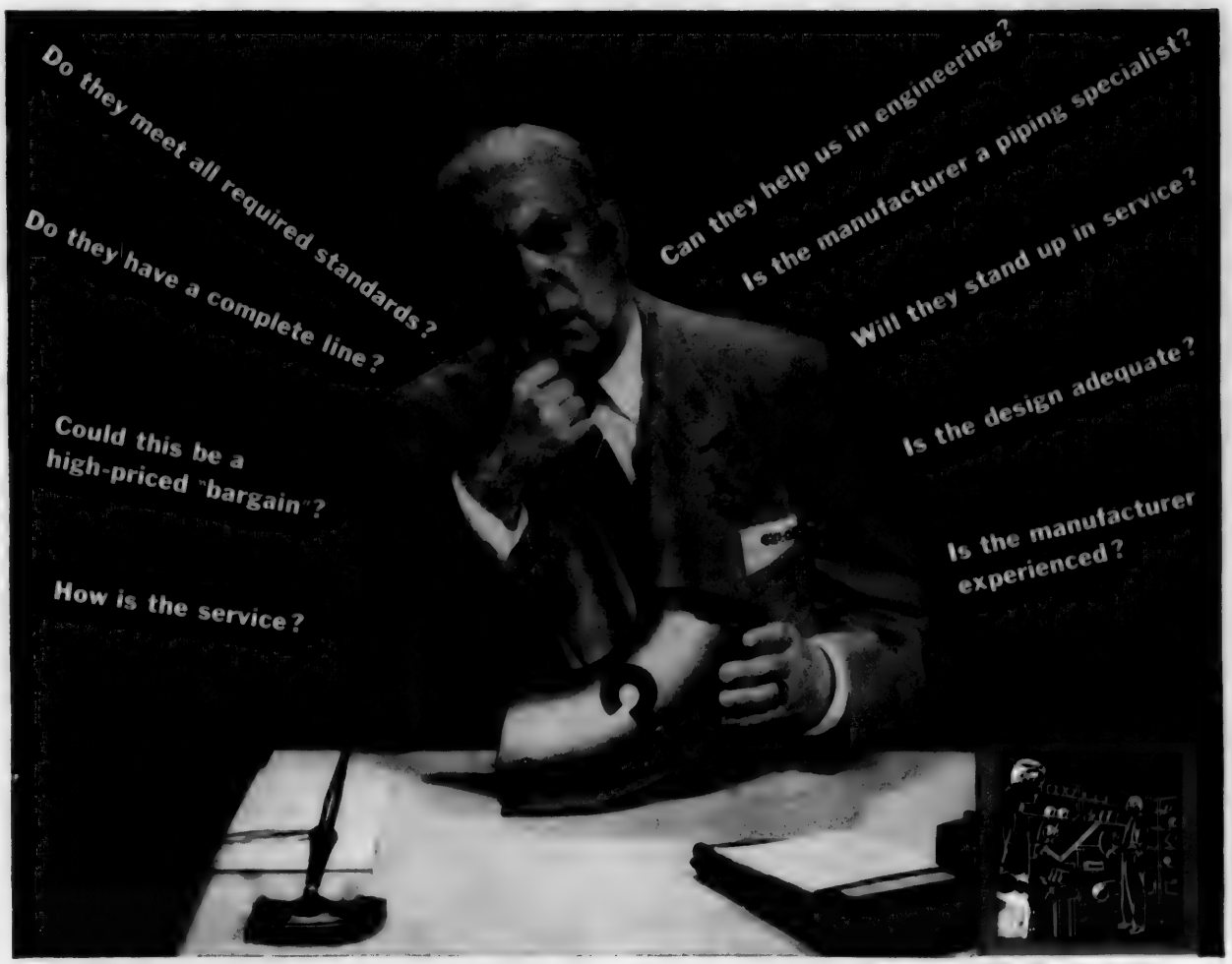
FIELD CONTROL DIVISION

of H. D. CONKEY & COMPANY, Mendota, Ill.

Affiliates

Conco Building Products, Inc. • Brick, Tile, Stone

Conco Materials Handling Division • Cranes, Hoists


Do they meet all required standards?
Do they have a complete line?
Could this be a high-priced "bargain"?
How is the service?
Can they help us in engineering?
Is the manufacturer a piping specialist?
Will they stand up in service?
Is the design adequate?
Is the manufacturer experienced?

Tube Turns' nearby complete stock SAVES YOUR PURCHASING TIME

Tube Turns' pioneering research GIVES YOU ADVANCED PRODUCTS

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You can eliminate the questions when you buy TUBE-TURN WELDING FITTINGS AND FLANGES

THE BEST BARGAIN in piping is a product that meets your strictest requirements at a fair price. TUBE-TURN* Welding Fittings and Flanges are made in the U.S.A. and are identified by the "TUBE-TURN" trademark. They meet *all* American Standard and Safety Code requirements. As the leading manufacturer in its field, Tube Turns can offer you unmatched engineering service, advanced products, and the most complete line of welding fittings and flanges available. You'll save time when you purchase, and avoid trouble later on, when you buy *known value*.

Your trusted Tube Turns' Distributor is at your service.

TUBE-TURN Welding Fittings and Flanges are made in U.S.A. They meet all U.S. piping code specifications.

*"TUBE-TURN" and "tt" Reg. U.S. Pat. Off.

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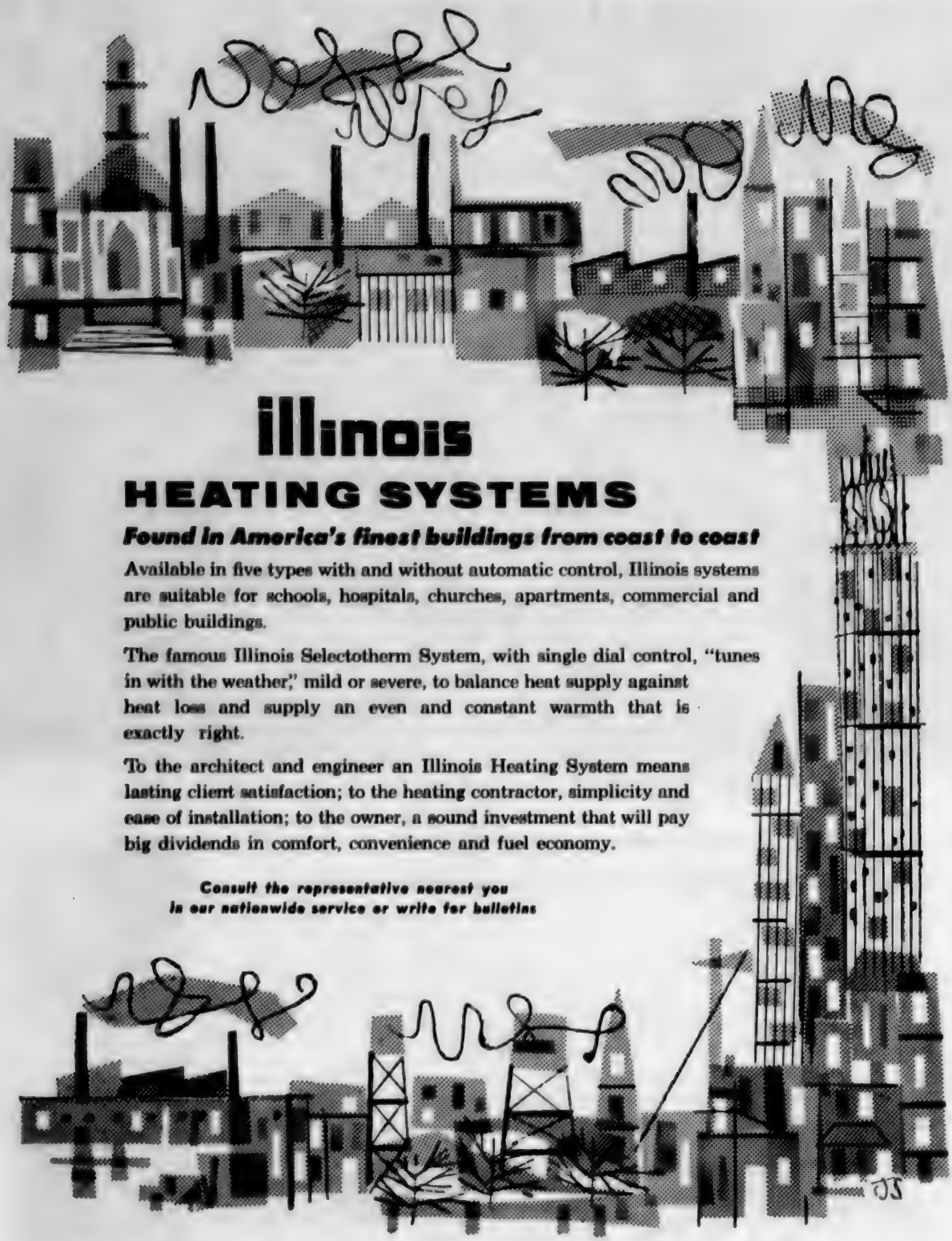


illinois

HEATING SYSTEMS

Found in America's finest buildings from coast to coast

Available in five types with and without automatic control, Illinois systems are suitable for schools, hospitals, churches, apartments, commercial and public buildings.

The famous Illinois Selectotherm System, with single dial control, "tunes in with the weather," mild or severe, to balance heat supply against heat loss and supply an even and constant warmth that is exactly right.

To the architect and engineer an Illinois Heating System means lasting client satisfaction; to the heating contractor, simplicity and ease of installation; to the owner, a sound investment that will pay big dividends in comfort, convenience and fuel economy.

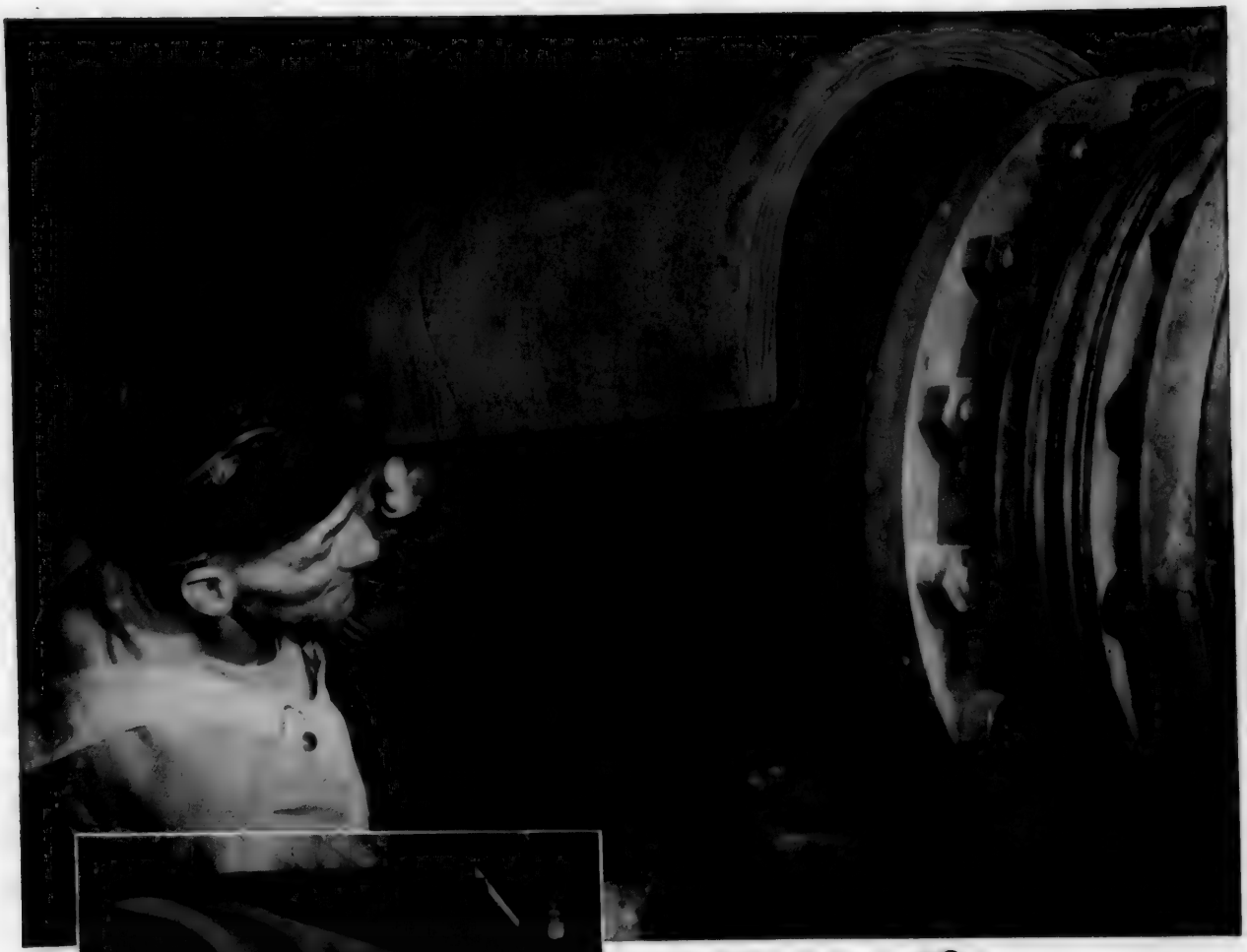
Consult the representative nearest you in our nationwide service or write for bulletins

illinois ENGINEERING

ILLINOIS ENGINEERING COMPANY

2045 SOUTH RACINE AVENUE • CHICAGO 8, ILLINOIS

DIVISION OF AMERICAN AIR FILTER COMPANY, INC.



SNAP*ON...

the modern, efficient way to insulate pipe

Take a good look at the unique one-piece glass fiber pipe insulation that insulates a 6-foot section of pipe as quick as you can say "Snap*On!" Then picture the savings in your plant when you put Snap*On on large or small, hot or chilled piping.

These on-the-job photos were taken at a midwestern university where large steam distribution lines in tunnels were recently insulated with Snap*On. The job was done in remarkably short time because of the exceptional ease of application. Workmen were pleased to discover that Snap*On weighed only 1/10 to 1/4 as much as conventional insulations—yet was so fibrous-tough that there was no breakage . . . no mess . . . no clean-up time.

An important secondary saving was the heat saving. Tests conducted on the finished job by the university showed the surface temperature of Snap*On to be 50° lower than that recorded on the insulation formerly used!

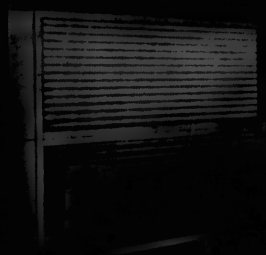
These are documented facts. The same sort of superior thermal efficiency and low-cost application can be yours if you insulate piping up to 33" in diameter, where temperatures do not exceed 350°. But see for yourself—write today for samples and Technical Bulletin SO-55 today.

GUSTIN-BACON *Manufacturing Company*

Thermal and acoustical insulations • Molded glass fiber pipe insulation • Pipe couplings and fittings

222 W. 10TH ST., KANSAS CITY, MO.

STOP using water!



Eliminate all water problems with UNICON by KRAMER. Any size compressor, regardless of tonnage, can be air-cooled with UNICON.

KRAMER **UNICON**

Stands, hoods, and wind deflectors are available for simplified outside mounting

You need nothing else!

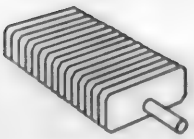
WRITE FOR BULLETIN U-210C

KRAMER TRENTON CO. • Trenton 5, N.J.

KRITZER
Radiant Panel Heating
advantages to the Heating Contractor

★ KRITZER QUALITY

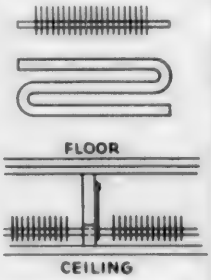
Lifetime coils of heavy aluminum fins permanently bonded to ⅝" O.D. copper tube. Materials and workmanship guaranteed.



★ LOW INSTALLATION COST

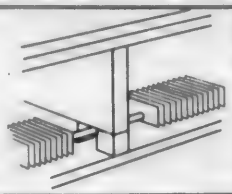
One section of Kritzer Coils equals many lengths of ordinary tubing.

Heating contractor can install entire system without special cooperation from other contractors because the coils are *not imbedded in any building material.*



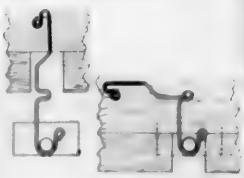
★ NO HEAT DAMAGE

Coils heat air only; they do not touch any part of the building. Therefore, no "call backs."



★ EASY INSTALLATION

With Kritzer "Redhead" hangers, the coils automatically go into proper position. All joints are sealed with solder rings.



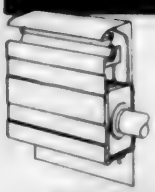
★ CUSTOMER SATISFACTION

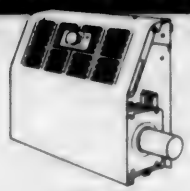
Thousands of Kritzer Radiant Panel installations are providing satisfying, healthful comfort in all climates—in all weather. A satisfied customer is your best salesman. Build a sales force with Kritzer Radiant Panel Heating.

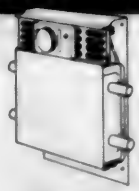
WRITE FOR BULLETIN 155

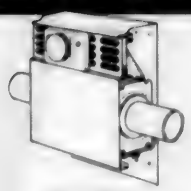
Please send your request on your company letterhead to: KRITZER RADIANT COILS, INC., 2901 Lawrence Avenue, Chicago 25.

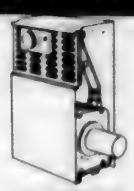
KRITZER QUALITY HEATING PRODUCTS

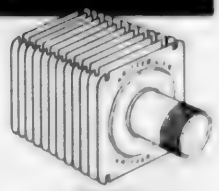

"K" LINE BASEBOARD


SLOPE TOP BASEBOARD


STANDARD BASEBOARD


UNIVERSAL BASEBOARD


CONVECTOR, SLOTTED FRONT


KRITZER FINNED TUBE

KRITZER

REPRESENTATIVES IN PRINCIPAL CITIES

SEE YOUR JOBBER FOR KRITZER PRODUCTS

"IF IT'S KRITZER, IT'S RIGHT, SIR!"

These customers will drive in...

when you have snow melting!

"Not just a convenience but a *distinct competitive advantage!*" . . . that's what merchants are saying about snow and ice removal systems for super markets, shopping centers, service stations, department stores and other commercial establishments selling to the public.

Clean, bare driveways, parking areas and sidewalks (contrasted with snowy, slushy street approaches and *un*cleared competitors' places) become a strong *invitation* for shoppers to "turn in" . . . to do business where they are so obviously wanted. That's not just theory, but *fact*, proved statistically by progressive businesses where steel pipe snow melting systems are at work.

Yes, *steel pipe* is the first choice for these installations. The known economy of steel pipe makes investment in a snow melting system economically practical. And in service, steel pipe has a performance record proved in more than 60 years in hot water and steam heating applications. Add to this the advantages of formability and weldability for coil fabrication and you know why steel pipe is the most widely used pipe in the world . . . for snow melting, heating, plumbing, fire sprinkler systems, power, steam and air transmission.

Send for the free 32 page booklet "Steel Pipe Snow Melting and Ice Removal Systems."

Committee on
STEEL PIPE RESEARCH
AMERICAN IRON AND STEEL INSTITUTE
350 FIFTH AVENUE, NEW YORK 1, N.Y.

Steel Pipe is First Choice

Announcing...

Thermostyling

by DETROIT CONTROLS

Here's New Sales Help for

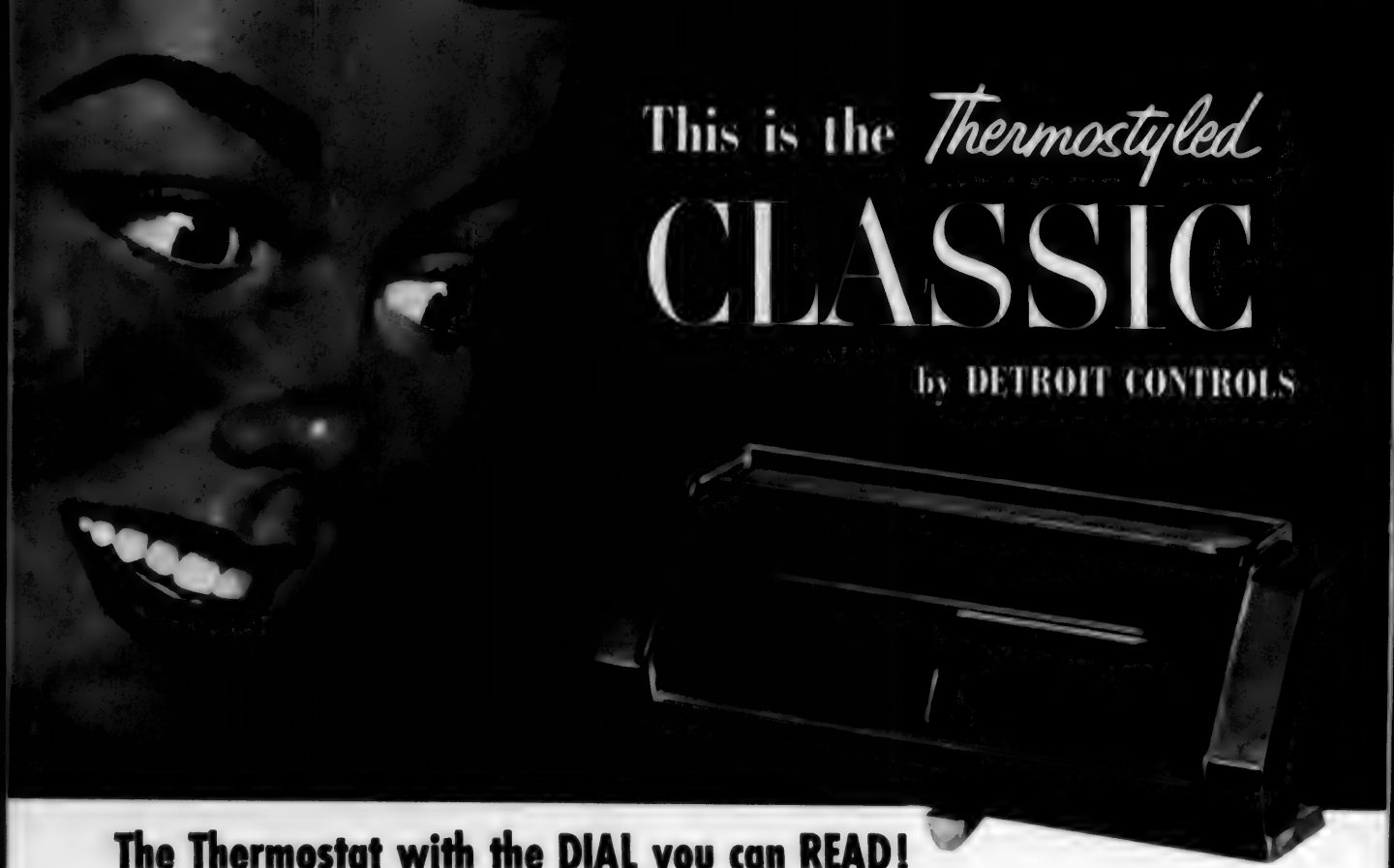
HEATING CONTRACTORS

WHOLESALERS

MANUFACTURERS

Get more business

NOW!



This is the *Thermostyled* CLASSIC

by DETROIT CONTROLS

The Thermostat with the DIAL you can READ!

NEW—HANDSOME—EFFICIENT

THE *Classic* is STYLED to SELL with—

EYE APPEAL You sense it at a glance! The CLASSIC blends gracefully with either period or modern decorating to accent the beauty of any room. CLASSIC is a masterpiece of crisp, balanced symmetry. The easy to read satin-black face is protected by a crystal-clear unbreakable lens. The gold-finished case completes its fine appearance.

FUNCTIONAL DESIGN One large numbered dial shows *both* temperature and setting. Horizontal dial is far easier to read and eliminates inaccurate reading due to angular vision. Convenient temperature adjustment is immediately beneath the indicator.

TIMED CYCLING Featuring the *new* two wire *adjustable* heater, Detroit's Timed Cycling CLASSIC eliminates overheating and underheating. It controls room temperatures within a fraction of a degree, provides the ultimate in comfort and economy.

SELL the Thermostyled *CLASSIC* for CUSTOMER SATISFACTION!

DETROIT CONTROLS CORPORATION
6900 TRUMBULL AVE. • DETROIT 8, MICHIGAN
Division of AMERICAN RADIATOR & STANDARD SANITARY Corporation

Representatives in Principal Cities • Canadian Representatives:
RAILWAY AND ENGINEERING SPECIALTIES, LTD.,
Montreal, Toronto, Winnipeg.

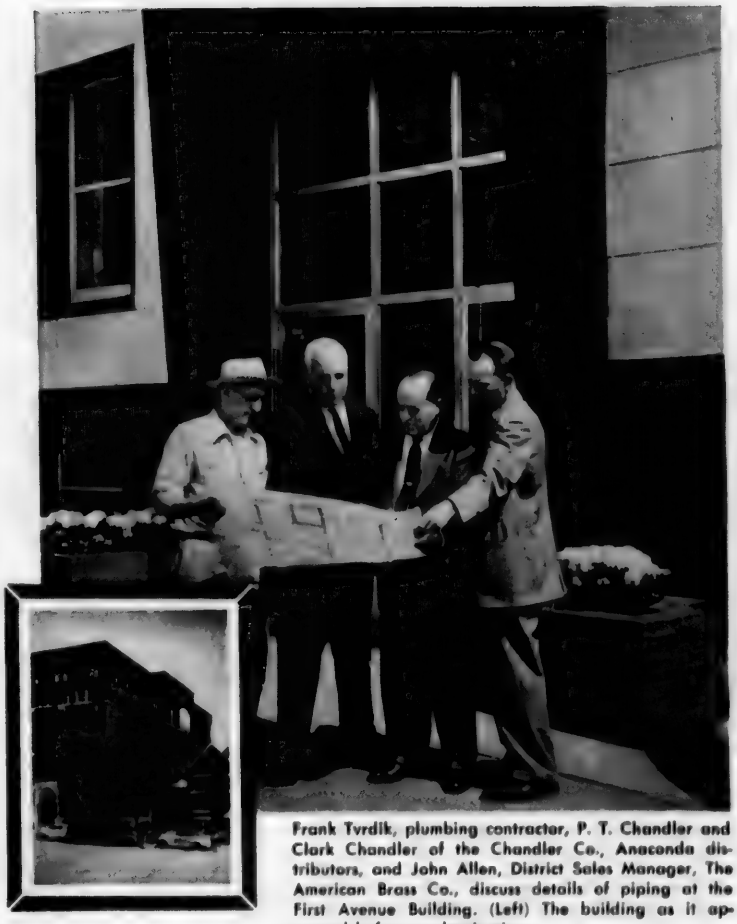
AUTOMATIC CONTROLS *for* REFRIGERATION
AIR CONDITIONING • DOMESTIC HEATING • AVIATION • TRANSPORTATION • HOME APPLIANCES • INDUSTRIAL USES
Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

AnacondA Copper Tube and Fittings cut installing time in half, says contractor

AnacondA Copper Tube installed in the air-conditioning machine room.

Note how neatly and compactly the copper tube was installed—through small openings in the massive old masonry walls.



Frank Tvrdik, plumbing contractor, P. T. Chandler and Clark Chandler of the Chandler Co., Anaconda distributors, and John Allen, District Sales Manager, The American Brass Co., discuss details of piping at the First Avenue Building. (Left) The building as it appeared before modernization.

Skogman Construction Co., General Contractor, Architect and Owner

Copper helps turn a venerable landmark into the "Cinderella" building of Cedar Rapids

The Rock Island Building in Cedar Rapids, Iowa, a sound old landmark, has been transformed into the First Avenue Building, the most modern, comfortable, convenient office building in the city. One of the big modernization problems was the handling of refrigeration and water service. Frank Tvrdik of Midwest Plumbing & Heating Co., plumbing contractors, used AnacondA Copper Tube throughout.

"Copper made the installation practical," says Frank Tvrdik. "Because the O.D. of copper tube is smaller and solder-type fittings are trim and compact, I could run lines through small openings and inside existing partitions. The 20' lengths reduced the number of fittings and the elimination of pipe-threading was a big time-saver. I saved additional time by prefabricating assemblies at the shop. Total time of installing the copper tube lines was half of what it would have been with ferrous pipe, which meant a considerable over-all saving on the job."

Find out how you can save by using AnacondA Copper Tube and Fittings. For information write The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass, Ltd., New Toronto, Ont. 8817

ANACONDA®

Copper Tubes and Fittings

Available through Anaconda Distributors

You Really Have to Listen to Hear CHICAGO HEATING PUMPS

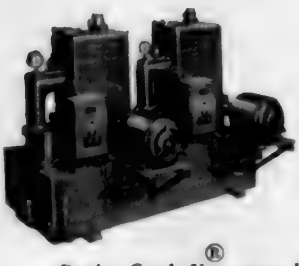
Quality Makes Them Quiet

In a heating pump, silence—or near silence is golden. It tells you, first of all, that here is a precision-made pump that will "pay off" through years of service . . . with least maintenance and continuous high performance. And quiet operation of a heating pump means quieter operation of the entire heating system.

A Size for Every Job

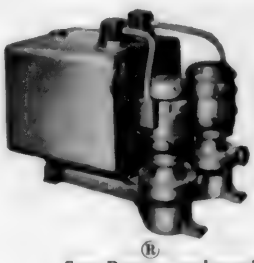
There are Chicago Heating Pumps for every type of heating job. This means you can get a Chicago Pump that exactly fits your requirements — in capacity, pressure, and equivalent direction radiation ratings. You don't have to accept a substitute that may labor at heavy loads and then need excessive maintenance to keep it in service. Specify Chicago Pumps and be sure of quiet, efficient pumping — always. Write to Department C for descriptive literature.

Type AVC condensation pump & receiver for 5,000 to 10,000 EDR and 10 to 30 psi. Write for Bulletin 245.

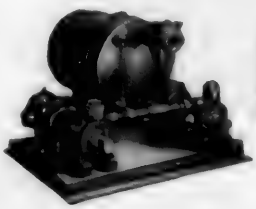


Duplex Condo-Vac® return line vacuum and boiler feed pump for vacuum systems at pressures to 40 psi, 2,500 to 150,000 EDR. Described in Bulletin 270.

Type CLL1 vertical condensation pump & receiver for low returns. 1,000 to 40,000 EDR and 10 to 52 psi. Bulletin 255.



Sure Return® condensation pump and receiver. Will not steam bind. For low and medium pressure systems to 75,000 EDR. Described in Bulletin 250.



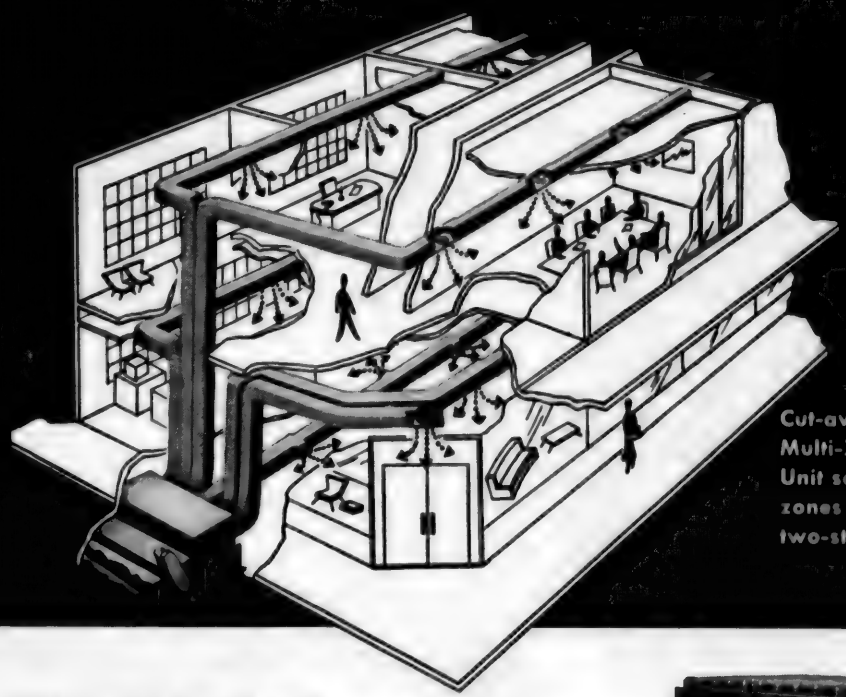
Duplex FC condensation unit for capacities up to 50,000 EDR and 150 psi. Described in Bulletin 260.

fmc **CHICAGO PUMP COMPANY**
Subsidiary of Food Machinery and Chemical Corporation
BUILDING PUMP DIVISION
600 DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

Condo-Vac ®, Sure Return ®, AVC, LVC, Fire, House & Circulating Pumps, Pneumatic & Tankless Water Systems, Flush Valves ®, Sewage Ejectors, Little Giant ® & Non-Clog Sump Pumps. Names for every industrial use.

Fact:

Westinghouse Multi-Zone Unit *blends* air-mixtures for *simultaneous unequal* cooling loads— Serves *up to 12 separate* zones



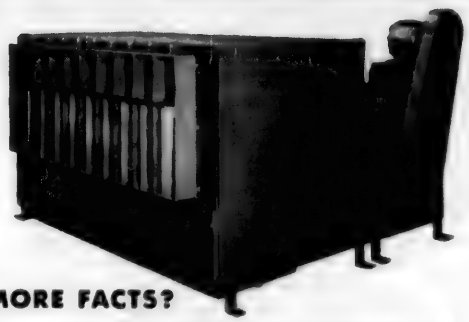
Cut-away view shows Multi-Zone Air Conditioning Unit serving six separate zones in a typical two-story installation.

Here's a rugged, compact central plant air conditioning unit that supplies air, *blended* for simultaneous unequal heat load demands, in various zones requiring individual temperature and humidity control.

Formerly, heat load variations could be controlled only by separate supply systems for each zone, or by expensive zone reheat arrangements.

Now . . . this problem can be solved with a single Westinghouse Multi-Zone Air Conditioning Unit. Efficient . . . economical . . . this versatile unit supplies air . . . conditioned at a central location . . . for the individual needs of as many as 12 zones.

Multi-Zone Units are of the blow-through type with divided outlets to serve multiple zones by supplying heated or cooled air, or controlled mixtures of both, to each zone (12-zone unit illustrated above).



MORE FACTS?

For complete information about Multi-Zone Air Conditioning Units, call on the "Man with the Facts", your Westinghouse-Sturtevant Sales Engineer . . . or fill in the handy coupon below.

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YOU CAN BE SURE...IF IT'S

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J-80448

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Hyde Park, Boston 36, Mass.

Please send more facts on your Multi-Zone Unit.

NAME AND TITLE .....

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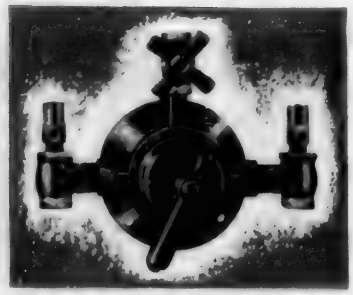
NOW, and TEN YEARS from now–

LAWLER will protect your reputation!



Model BE Exposed

. . . thermostatic shower mixing valve. Finished in polished chrome . . . equal in construction and design with the BC Concealed.

NOW — NEW STREAMLINED DIAL PLATE REPLACES FOUR, HIDES ALL

For clean modern lines and neater installations, the NEW LAWLER "BC" SHOWER MIXING VALVE leads the field. Valve, stops and checks with strainers now appear as one unit . . . *concealed behind the dial plate, yet readily accessible.* Exposed parts finished in polished chrome. Internal sliding parts are stainless steel.

Lawler's "Performance-Tested" design combines pioneering experience with engineering leadership. The use of specially chosen metals assure YOUR customers years of positive, accurate temperature control with lowest maintenance cost . . . the best insurance YOUR REPUTATION can have.

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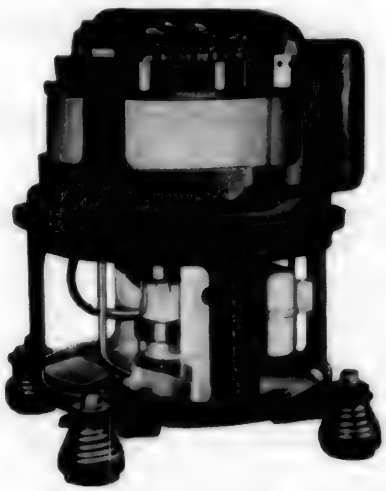
Engineered for low-cost operation, powered for years of whisper-quiet performance . . . Copeland combines the most-wanted compressor features into COPELAWELD, the ideal unit for your refrigeration and air conditioning products.

Cool-running two-cylinder Copelawelds are free from vibration and chatter. Heavy-duty, high-power-factor motor delivers exceptionally high capacities at minimum current input. Freon-12 and Freon-22 models. Sizes ⅓ H.P. through 1½ H.P.

Get acquainted with the Copeland welded motor-compressor. Field-test Copelaweld in your own equipment, and sample the performance that is the industry's standard. See your Copeland dealer or write us direct.



COPELAWELD
⅓ H.P. through 1½ H.P.

Copeland
DEPENDABLE Refrigeration

COPELAND REFRIGERATION CORPORATION
SIDNEY, OHIO

Ideal Indoor Weather for new Houston Post building

Honeywell Electronic Control Panel operates 400-ton cooling plant automatically

New Honeywell control panel measures water temperature and flow, then selects proper cooling unit

A NEW method of regulating indoor weather is in use in the Houston (Texas) *Post's* modern publishing plant. It features a special control panel that governs the plant's 400-ton cooling system.

This special panel, a Honeywell Color-Graphic, automatically stops and starts the building's 150 and 250-ton centrifugal compressors. And it automatically operates the 150-ton, 250-ton unit, or both — depending on cooling needs. This assures the greatest economy of operation. Picture captions explain its functions in detail.

Throughout the building, from press room to executive offices, comfort levels are maintained summer and winter by strategically placed electronic thermostats. They're readily adjustable on the spot to meet the rapidly shifting comfort needs of a daily newspaper's large staff.

Automatic changeover from heating to cooling helps achieve both efficiency and economy.

These features and others described here demonstrate how electronics can bring modern atmosphere control to any building: you easily gain ideal indoor comfort through ideal control of temperatures and air circulation.

The techniques used to solve comfort problems of the Houston *Post* can help you provide better working weather for your clients. For a Honeywell Electronic Customized Temperature Control installation is designed to fit the needs of the building and its occupants.

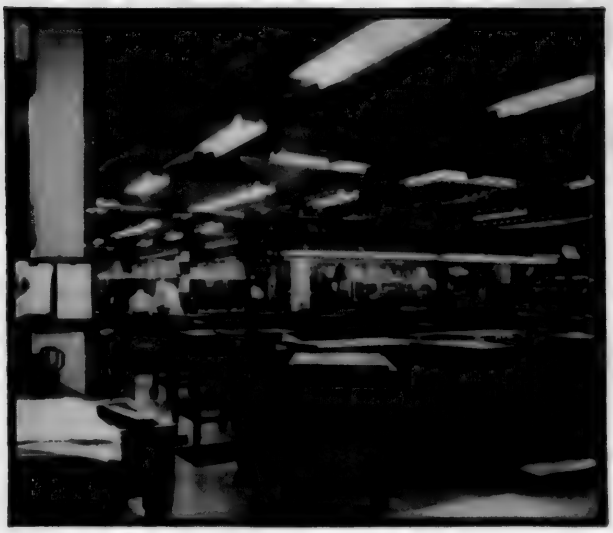
For comfortable, more productive temperatures in new or existing buildings—of any size—specify Honeywell Electronic Customized Temperature Control

Whether it's a plant, bank, office, church, school, motel, hospital—any building of any size, new or existing—flexible Honeywell Electronic Customized Temperature Control can help meet your clients' heating, ventilating, air conditioning and industrial control requirements.

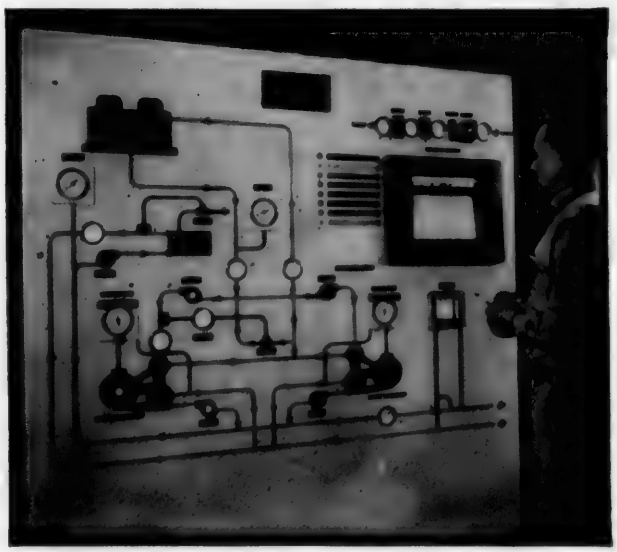
For all the facts on Honeywell Electronic Customized Temperature Control, and the economical Honeywell Periodic Maintenance Plan, call your Honeywell office. Or write Honeywell, Dept. HV-9-124, Minneapolis 8, Minn.

Air conditioned pressroom is an unusual feature of the Houston *Post* building. Despite heat generated by the huge presses, Honeywell controls maintain comfortable working temperatures, can be adjusted on the spot to meet varying comfort needs.

Herbert Voelcker & Associates, architects. Charles V. Chenault, consulting engineer. E. Lee Bond General Contractor. Wood-Lappard Air Conditioning Company, mechanical contractors.



Large open areas, like the Houston *Post* composing room, are held at maximum comfort throughout. Inexpensive, simply constructed electronic thermostats are placed at strategic locations in the building.



Key feature of the Houston *Post's* comfort system is the Honeywell Color-Graphic electronic control panel. Carefully customized to the building's special needs, the panel operates two centrifugal compressors, two chilled water pumps and two condenser water pumps. With electronic accuracy, it *automatically* guides these units through the operational cycle, going from minimum to maximum cooling capacity of 400 tons. The panel also determines cooling load requirements by an ingenious method; measuring temperature differential of supply and return water, and gallons per minute being delivered to the system. Completely automatic operation frees a full time engineer for other duties. Normally a cooling plant of this size requires his full attention.

Advantages of an Electronic Control System

An Electronic control system is the most *flexible* control system you can use. It lets you:

operate your thermostats *as* you want to

sequence from your thermostats *when* you want to

locate your thermostats *where* you want to

compensate your thermostats *as much as* you want to

W. Howard Baldwin, Houston *Post* vice-president and general manager, says: "Our new four-million-dollar plant was built with an eye to the future. Electronic temperature control, plus control centralization with a Color-Graphic panel by Honeywell, were selected to ensure a modern control system for the many years to come."

MINNEAPOLIS
Honeywell

Electronic Controls

112 offices across the nation

Why users like Bethcon

We asked a customer why he liked to work with our Bethcon continuously galvanized sheets. The answer came without hesitation:

"It's the first galvanized sheet we've found that will take our severe forming operations without flaking or cracking."

That, undoubtedly, is the one most important advantage of Bethcon sheets. Bethlehem's modern continuous galvanizing lines give the steel a coating that adheres much more tightly. In fact, the Bethcon coating is so tight, that even when the sheet is doubled back on itself the coating does not crack or flake off.

But Bethcon has other advantages, too. The coating is more uniform, so that the center and ends of Bethcon sheets get equal coating weight and equal protection. The heavy zinc bead ordinarily found on the drip end of a galvanized sheet is eliminated.

Bethcon is better-looking. The spangles are bright, uniform, attractive in appearance. Sheet-metal contractors find this a helpful sales point to mention.

You can get Bethcon sheets in cut lengths or in coiled strip, 16-gage or lighter. Either plain carbon steel or corrosion-resisting Beth-Cu-Loy (copper-bearing steel) can be used for the base metal, depending on the requirements. For further information, just get in touch with the nearest Bethlehem office.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

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BETHLEHEM STEEL

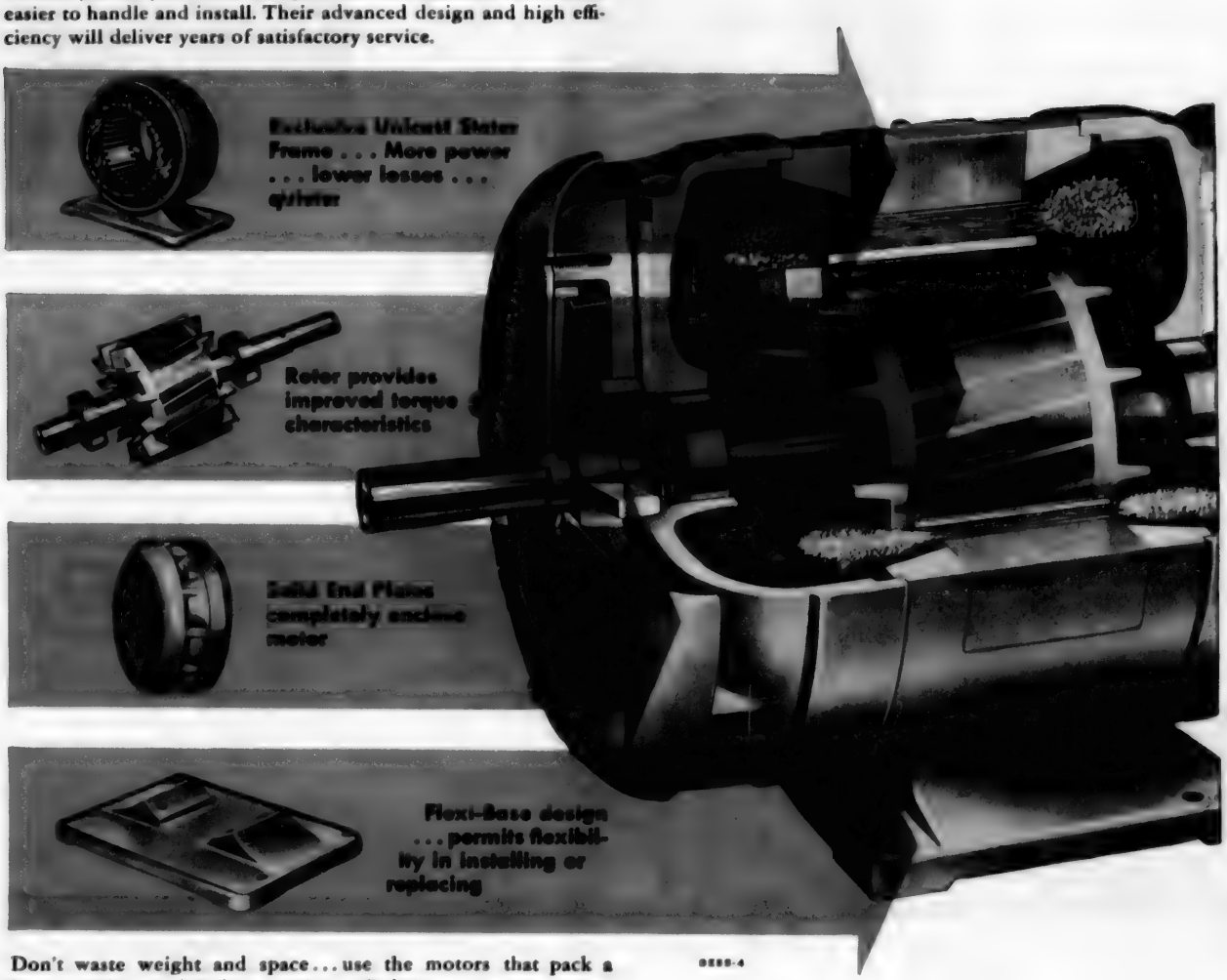
BETHLEHEM STEEL

BALTRIC

the motor that doesn't waste an ounce or an inch

The *Streamcooled Baltric* line of totally enclosed motors is *new* and *better*... because it is more compact, more efficient, lighter. Using modern materials and knowledge ... improvements that boost efficiency and trim poundage ... new insulation ... permitting us to build compact power packages that do more work for their size and weight than outdated models of similar ratings.

These powerful, rugged new *Streamcooled Baltric* Motors will do a better job for you. Their compact size and lightness make them easier to handle and install. Their advanced design and high efficiency will deliver years of satisfactory service.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Rotor provides improved torque characteristics
Solid End Plates completely enclose motor
Flexi-Base design ... permits flexibility in installing or replacing

Don't waste weight and space... use the motors that pack a heavyweight punch in bantam size ... *Baltric.*

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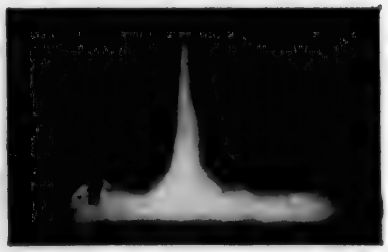
For spot

Solve all your industrial heating

A flood of heat . . . . . .

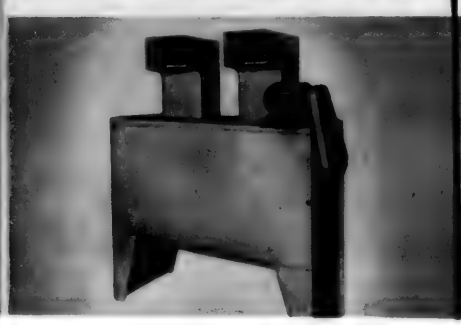


. . . . . or a pinpoint spot.

ANY HEATING PATTERN

at any time! Laboratory smoke tests (above) show how TRANE Unit Heaters with exclusive patented Louver Diffusers can direct heat in *any* direction, in *any* proportion—even in *different* directions and proportions at the same time. Unretouched photos prove flexibility of these TRANE units—unequalled by any other unit heater made.

FOR LARGE AREAS, TRANE Torridors have powerful centrifugal fans . . . capacities up to 1½ million Btu's. Use with or without ducts—for heating, ventilating, filtering, process drying.



FOR DOORWAYS, cold walls and general heating—TRANE Horizontal Unit Heaters with exclusive patented Louver Fin Diffusers are a flexible, economical answer. Hot water, steam or gas-fired.

BENEATH WINDOWS and skylights, TRANE Wall-Fin provides low-cost draft protection. May be tiered for extra capacity, installed with expanded metal or heavy gauge steel cabinets.

heating or space heating . . . process or comfort

needs with this one source of supply!

Trane—the industry's most complete line—simplifies selection, installation, maintenance . . . concentrates responsibility!

TRANE PRODUCTS are *matched* products. Designed together, built together—for service together. So there is one source for all the information needed for proper selection, installation, and maintenance. Responsibility is concentrated in *one* reliable source. For the complete details on this *complete line*, see your nearest TRANE Sales Office or write TRANE, La Crosse, Wisconsin.

TRANE

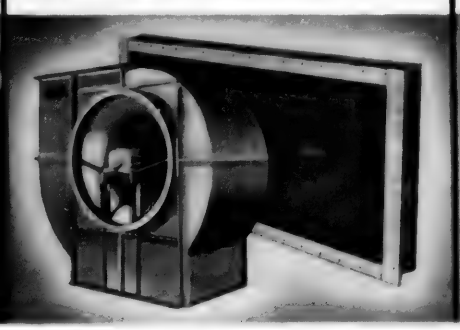
MANUFACTURING ENGINEERS

One source, one responsibility for: Air Conditioning Heating · Ventilating · Heat Transfer Equipment

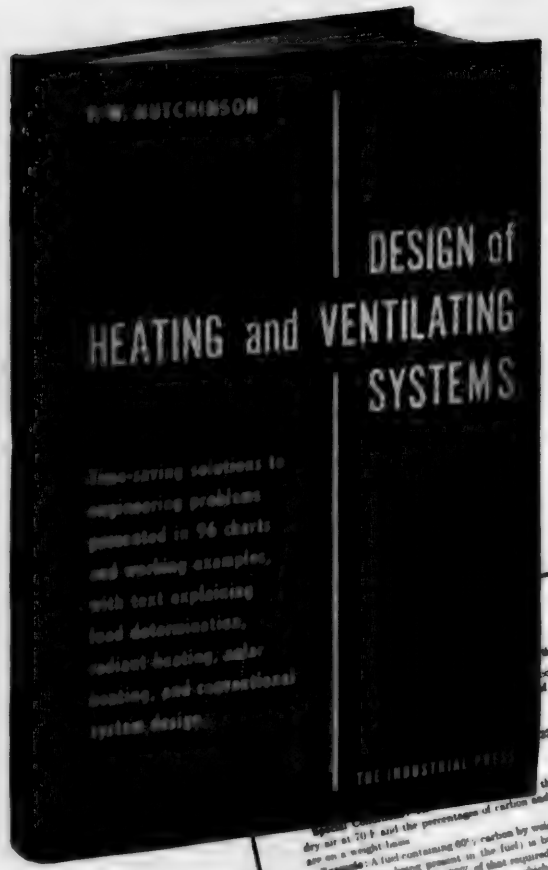
The Trane Company, La Crosse, Wis. • Eastern Mfg. Div., Scranton, Pa. • Trane Co. of Canada, Ltd., Toronto • 90 U.S. and 17 Canadian Offices.

FOR WALL-TO-WALL heating, TRANE Wall Line Convectors combine low initial cost with low installation cost to meet even the tightest heating budgets. Attractive cabinets blend with room.

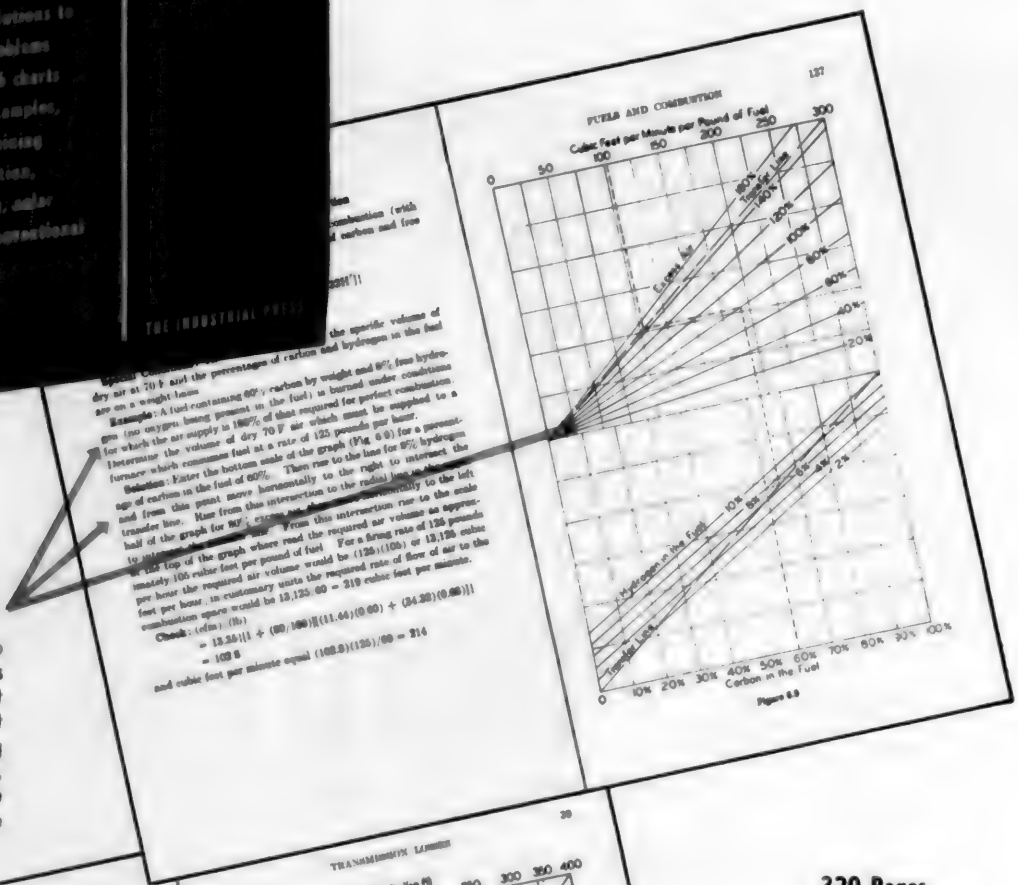
FOR "BUILT-UP" SYSTEMS, TRANE Fans and Coils are "matched" for service together. Exclusive TRANE features give top efficiency, durability—reduce maintenance to a minimum.



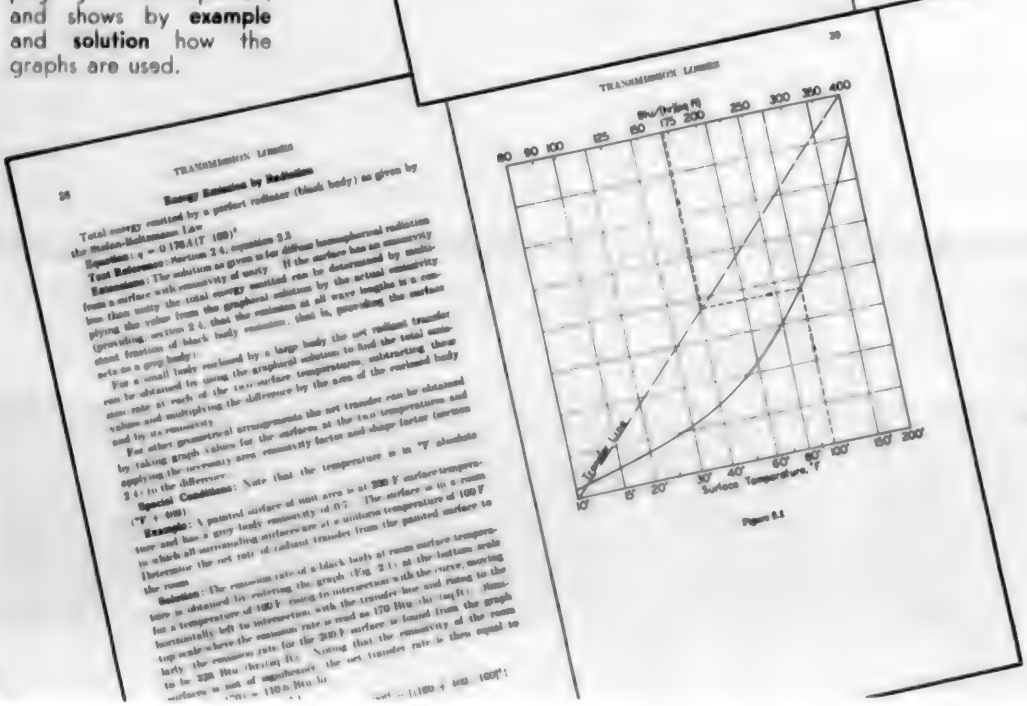
FOR SAVING FUEL, TRANE Radiator, Float, or Bucket Traps, Strainers, Valves and Vents add efficiency, stop waste. For low, medium or high pressure systems in either heating or process applications.


F. W. HUTCHINSON
DESIGN of
HEATING and VENTILATING
SYSTEMS
Time-saving solutions to engineering problems presented in 96 charts and working examples, with text explaining load determination, radiant heating, solar heating, and conventional system design.
THE INDUSTRIAL PRESS

New!



TYPICAL PAGES from the book show two of the 96 full-page **graphs** which permit the direct solution of important equations. Each facing page gives the equation, and shows by **example** and **solution** how the graphs are used.


TRANSMISSION LINES
Energy Emission by Radiation
Total energy emitted by a perfect radiator (black body) as given by the Stefan-Boltzmann Law
Equation: q = 0.1714 (T/100)⁴
Text Reference: Section 2.4, equation 2.3
Extensions: The solution as given is for diffuse hemispherical radiation from a surface with emissivity of unity. If the surface has an emissivity less than unity the total energy emitted can be determined by multiplying the value from the graphical solution by the actual emissivity (preceding, section 2.4, that the emission at all wave lengths is a constant fraction of black body emission, that is, preceding the surface acts as a gray body).
For a small body enclosed by a large body the net radiant transfer can be obtained by using the graphical solutions to find the total emission rate at each of the two surface temperatures, subtracting these values and multiplying the difference by the area of the enclosed body and by its emissivity.
For other geometrical arrangements the net transfer can be obtained by taking graph values for the surfaces at the two temperatures and applying the emissivity area emissivity factor and shape factor (section 2.4) to the difference.
Special Conditions: Note that the temperature is in °F absolute (°F + 460).
Example: A painted surface at unit area is at 200 °F surface temperature and has a gray body emissivity of 0.9. The surface is in a room in which all surrounding surfaces are at a uniform temperature of 100 °F. Determine the net rate of radiant transfer from the painted surface to the room.
Solution: The emission rate of a black body at room surface temperature is obtained by entering the graph (Fig. 2.1) at the bottom scale for a temperature of 100 °F moving to intersection with the curve, moving horizontally left to intersection with the transfer line and moving to the top scale where the emission rate is read as 170 Btu/hr/sq ft. Similarly the emission rate for the 200 °F surface is found from the graph to be 328 Btu/hr/sq ft. Noting that the emissivity of the room surfaces is not of significance the net transfer rate is thus equal to
Figure 6.1

320 Pages
96 Charts and Illustrations

$7.00

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An investment in accuracy and time-saving that will repay you many times over!

A Book to Help You Solve Heating and Ventilating Design Problems

If you are concerned with problems in the design of heating and ventilating systems, here is a book that will save you hours of time and, in addition, insure accurate calculations for many complex calculations.

You can solve problems involving load determination, duct design, panel heating, solar heating and combustion analysis *directly* by means of the 96 full-page working graphs which are an outstanding feature of the book. In many cases the use of these graphs will entirely eliminate calculation, while in others the graphs serve to minimize the arithmetical work needed in solving the equations. The scales used in constructing the graphs have been selected so that *the accuracy to which each graph can be read will equal or exceed the limits of accuracy of the equation from which it was derived.*

Opposite each graph is a design example and the solution illustrating the use of the method.

Explanatory text in each chapter clearly explains the engineering background and the mathematical basis of each graphical solution. Basic handbook data are also included so that, with the simple insertion of field data, design situations can be analyzed.

Another important feature of the book is the inclusion of complete data for systems designed to utilize partial solar heating through the use of large picture windows. This is the first text on heating to include engineering data on this increasingly important subject.

The author is Professor of Mechanical Engineering at the University of California. He is the author of "Industrial Heat Transfer" and co-author of a number of books on panel heating, refrigeration and air conditioning. His knowledge of the field is well grounded on practical experience as well as theory, as he acts as consultant for many industrial firms.

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Introduction
Load Determination: Transmission Losses
Load Determination: Intermittent Heating
Load Determination: Ventilating and Humidification
Load Determination: Losses from Ducts, Pipes and Tubes
Fuels and Combustion
Air Distribution
Conventional Heating System Design Procedure
Panel Heating Design Procedure
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YORK-POWER

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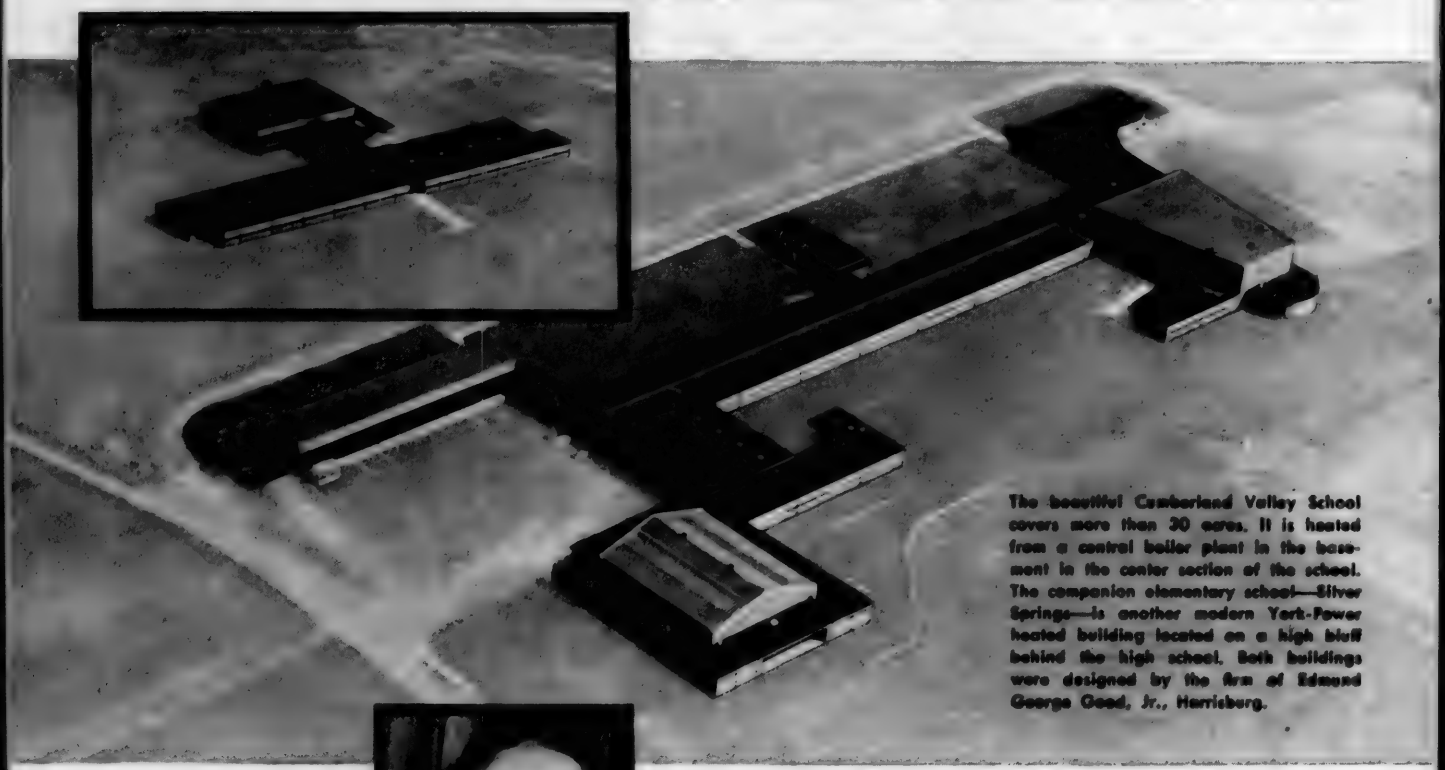


The beautiful Cumberland Valley School covers more than 30 acres. It is heated from a central boiler plant in the basement in the center section of the school. The companion elementary school—Silver Springs—is another modern York-Power heated building located on a high bluff behind the high school. Both buildings were designed by the firm of Edmund George Good, Jr., Harrisburg.

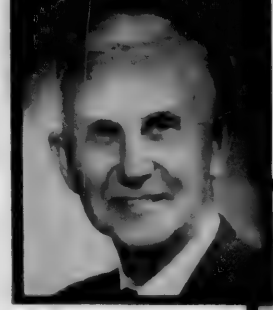
IN BOILER ROOM DESIGN

Edmund George Good, Jr., registered architect, Harrisburg, Penna., found that the York-Power Factory-Coordinated fuel burning systems offered the modern unitary design features that he desired in planning the boiler rooms for the prize-winning Cumberland Valley School jointure west of Harrisburg. "This equipment gave us the necessary controls and safety features which are so important," Mr. Good stated.

IN BOILER ROOM ENGINEERING

Charles Johnson, P. E., consulting engineer of Lemoyne Penna., heating and air-conditioning specialist, reports the "York-Power's F/C panel board with its packaged control system, with all controls factory wired for easy connection in the field, simplified installation and eliminated ragged field wiring."

IN EQUIPMENT INSTALLATION



"The York-Power F/C system with its windboxes and refractory rings for quick installation of York-Power burners to the boiler eliminated costly boiler checker-work in the installation and the factory-wired F/C panel board enabled us to make fast, economical installation of the oil-fired system," R. E. Wolfe, Harrisburg heating contractor for Cumberland Valley School, stated.

"Our confidence in York-Power burners, built up through years of experience with the equipment, was fully justified in the installation at the Silver Springs School," Walter C. Eshenaur, Penbrook (Harrisburg) heating contractor, reported. "The start up was good and the automatic operation with modulation was trouble-free during the first heating season."

F/C SYSTEMS HELP COST SAVINGS

CONDITIONS IN MODERN SCHOOLS

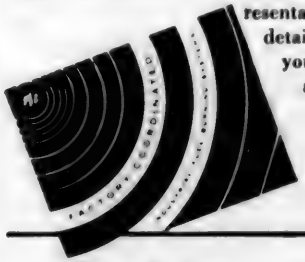
F/C Panel Boards, part of the complete York-Power factory coordinated industrial fuel burning system, protect all controls from damage, dirt, and dust because they are housed in air-tight steel cabinets. F/C Panels are unitary in design so that all auxiliary units can be installed adjacent to them to provide an eye-appealing set up. Controls within the panels are wired at the factory to terminal strips for fast, trouble-free field wiring. These completely factory-coordinated fuel burning systems provide the modern answer to economical, low-cost installations.

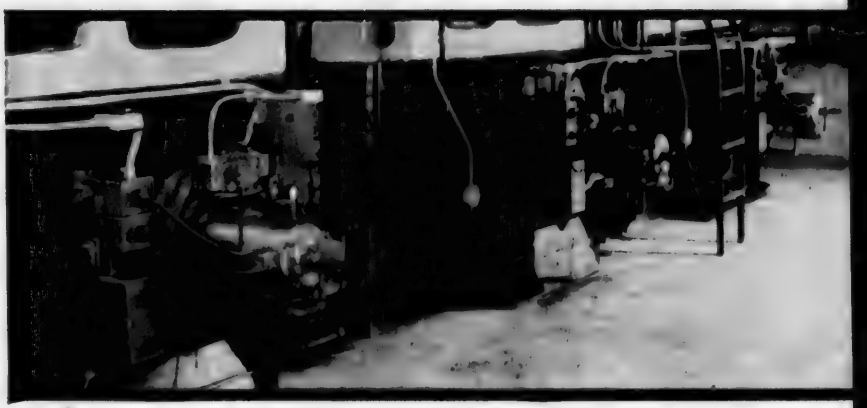
F/C PANEL BOARDS

These York-Power F/C Panel Boards provide the control for three burners in the high school. Main panel boards (Model F/C 1001) include the controls for FP-2 System. Subsidiary panels handle: Draft Inducer; Master Relay Controls. ● Details of wiring of a main panel are shown in inset photograph.

Larry Witmer, engineer in charge of the Cumberland Valley School installation says "The York-Power F/C System makes my job of power plant operation and supervision much easier because all of the controls are easy to service, and are kept clean in their dust-free steel cabinets."

The heart of the York-Power F/C System is the time-tested, field-proven York-Power Horizontal Rotary Oil Burner. These precision fuel-burning units provide complete modulation over the entire firing cycle. They are designed for operation with light or heavy oil, and/or gas, and have all of the advanced engineering features necessary for precision combustion. York-Power F/C windbox assemblies provide the precise air control necessary, plus the added feature of quick installation. Ask your York-Power representative for further details, or write on your letterhead for a free copy of 12-page F/C booklet.





F/C FUEL BURNING SYSTEMS

The Cumberland Valley School installation includes three C-175-AGM (15 to 60 G.P.H.) York-Power Industrial Burners attached to the boilers with York-Power windbox assemblies. Two No. 400 Pump Sets handle the fuel oil. ● Two B1-100-AGM Burners (11 to 33 G.P.H.) fire the boilers for Silver Springs Elementary School. Two No. 225 Pump Sets are used. These burners are shown in the photograph at the bottom of the page.

YORK-SHIPLEY, INC.

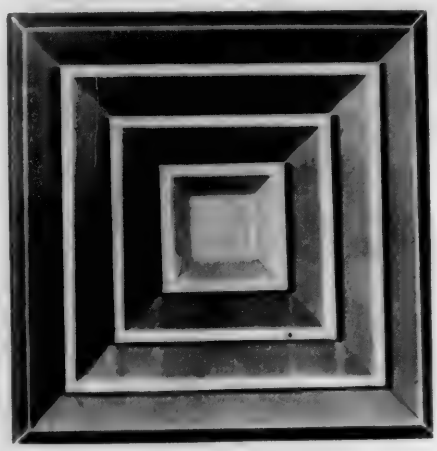
YORK, PENNSYLVANIA

INDUSTRIAL POWER AND HEATING SPECIALISTS SINCE 1918

NEW!... AT CARNES

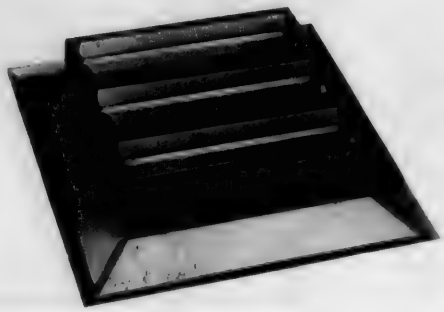
1-2-3-4 WAY AND 2-WAY CORNER SQUARE AND RECTANGULAR

CEILING DIFFUSERS



MODELS SFS AND SFR

Here is a new line of square and rectangular diffusers, by Carnes. Models SFS (surface-mounted) and SFR (for recessed ceilings)—are scientifically and artistically designed with the corner air scoop on the back side of the deflecting vanes to assure a 360° air distribution pattern. The 4-way blow diffuser, illustrated at the left, is an example of the attractive, symmetrical appearance of this new line—an improved and re-designed selection of diffusers that features extremely easy installation . . . sturdy construction . . . maximum efficiency . . . extremely quiet operation . . . attractive prices. And—the wide variety of blows makes blank-off baffles unnecessary.



MODEL IVS
SQUARE AND RECTANGULAR
DIFFUSER DAMPER

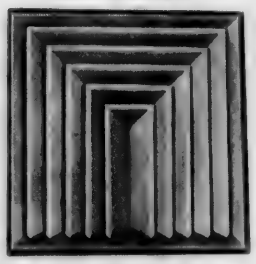
This opposed blade damper, when installed directly to the ceiling plate becomes an integral part of the diffuser. These three simple steps completely install Carnes square and rectangular diffusers and dampers:

1. Attach ceiling plate to duct with sheet metal screws.
2. Insert damper and attach to ceiling plate with four sheet metal screws.
3. Snap inner vane assembly into place—no screws or tools necessary—this assembly is held in place by spring catches.

Only a few minutes for the complete installation—and the damper is completely adjustable from the face of the diffuser—simplifying balancing.

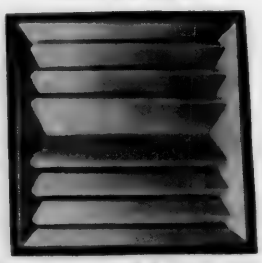
AVAILABLE IN ALL AIR DISTRIBUTION PATTERNS

3-WAY



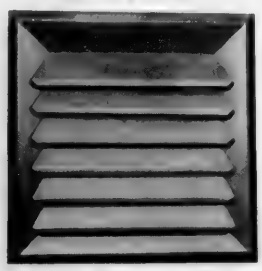
SFS-3 and SFR-3—deliver an equal portion of air evenly in three directions.

2-WAY



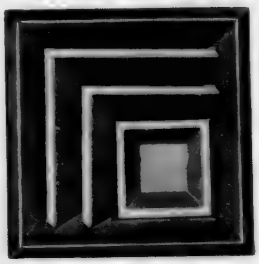
SFS-2 and SFR-2—ideal for long rooms and corridors.

1-WAY



SFS-1 and SFR-1—in all sizes, available with vanes running in either direction.

2-WAY CORNER



SFS-2C and SFR-2C—for room or corridor corners where right angle blows are necessary.

FOR COMPLETE INFORMATION, WRITE

CARNES CORP.

VERONA, WISCONSIN

when STYLE *makes the sale*

Style is all-important when selling women's garments. And style is also a vital consideration in building quiet, efficient air conditioners. The UNARCO *ROYAL-AIRE*® is a smooth-operating conditioner, that is functionally styled to provide *balanced* air intake, assuring quiet performance.

Wherever people gather the UNARCO *ROYAL-AIRE* supplies comfort cooling, adding distinction and profit. Salesmen and customers alike are more relaxed, *more receptive* when comfortably cooled.

Plus features of the *ROYAL-AIRE* include an accessible hermetic compressor that minimizes maintenance, an oversize variflow blower and vertical cooling coil to provide maximum output, and the exclusive UNARCO pump-down control system which guarantees instant response.

For clothing store or drug store, restaurant or office, the *ROYAL-AIRE* is your *economical* buy! We invite inquiries and shall be happy to send you descriptive literature. Write HEATING & COOLING DIV.

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UNARCO ROYAL-AIRE *a distinctive* AIR CONDITIONER

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● Look under "The Youngstown Sheet and Tube Company" in one of these alphabetical or classified phone books.

They represent the 28 conveniently located district sales offices Youngstown maintains across the country. Offices staffed by men who are specialists in steel and who know pipe. They understand your problems and are qualified to help you get the pipe you need.

If you aren't in touch now with a Youngstown pipe distributor, just call the Youngstown district office nearest you and we will help you solve your pipe problems.

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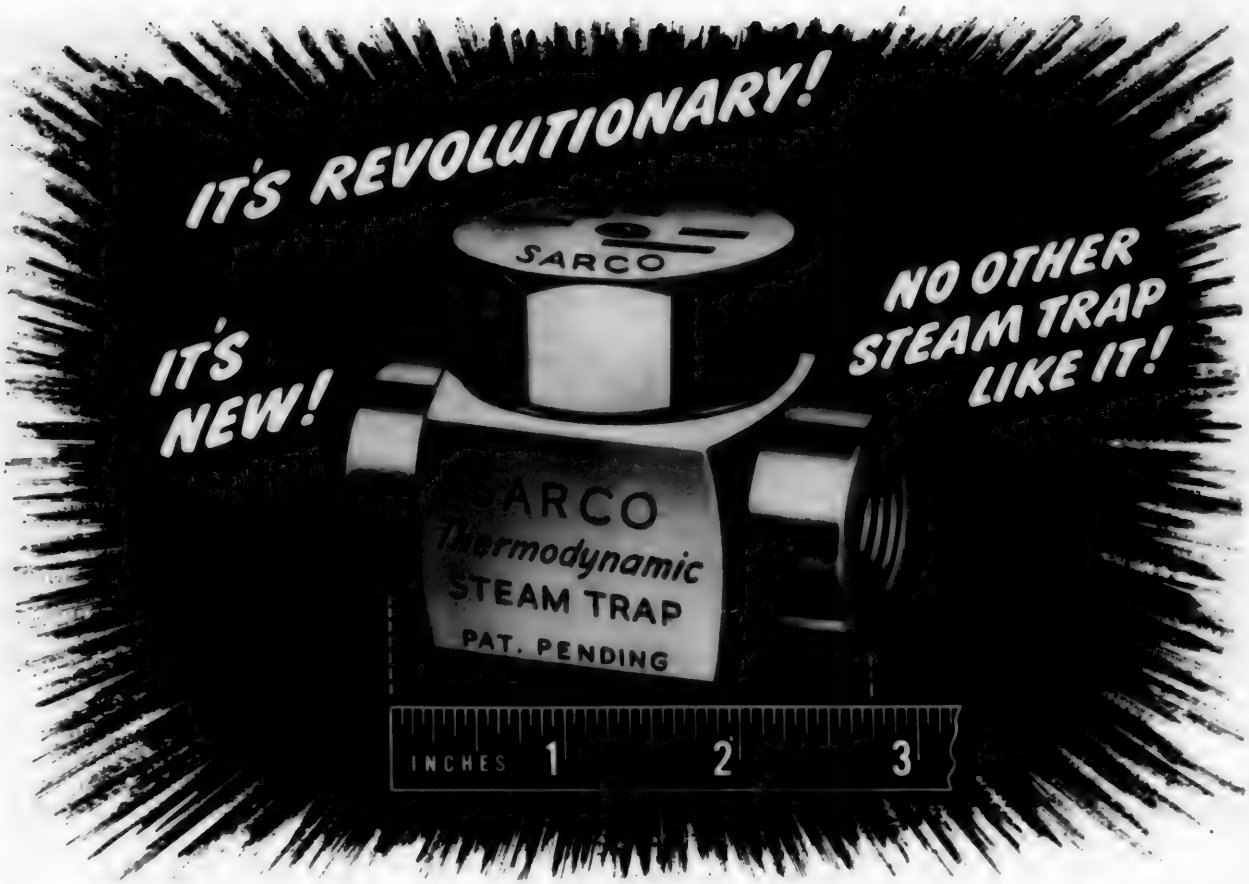
THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices Youngstown, Ohio District Sales Offices in Principal Cities.

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - BLACK PLATE - RAILROAD TRACK SPIKES - MINE ROOF BOLTS



New Sarco Thermodynamic Steam Trap practically eliminates maintenance!

Only moving part—a hardened Solid Stainless Steel Disc—practically wear-proof!

SOME OF MANY ADVANTAGES

1. Same trap for all loads and pressures 10-600 psi.

2. Closes tight on no load.

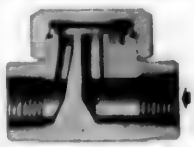
3. Operates against back pressures up to 50% of inlet pressure.

4. Not affected by superheat, water-hammer, vibration, corrosive condensate.

5. Smallest inventory of spare parts.

SIMPLICITY—to the Nth degree!

No valve-closing mechanisms to wear or stick. No critical clearances to choke. No gaskets to leak. Three simple parts...machined from stainless steel bar stock. Only one moving part.
What could be simpler?



SARCO COMPANY, INC.

2133-B

Sarco Company, Inc., Empire State Bldg., New York 1, N. Y.

Please send me: ☐ Bulletin 255-44
☐ A Sarco Thermodynamic Steam Trap for 60-day trial. Size_____ for installation on_____

NAME_____

FIRM_____

ADDRESS_____

CITY_____ STATE_____

Grumman Peconic River Plant in Calverton. Architects: Office of Alfred Easton Poor; consulting engineers: Seelye Stevenson Value and Knecht and Guy B. Panero; air-conditioning contractors: J. L. Murphy, Inc.—all of New York, N.Y.

Grumman jets are made in a factory *that "breathes"*

New Grumman aircraft plant is completely closed in and soundproofed. American Blower equipment is used to create a controlled, comfort-conditioned indoor climate.

The new Peconic River Plant of the Grumman Aircraft Engineering Corporation, in Calverton, L.I., N.Y., is one of the first aircraft factories built solely for jet assembly and flight operations.

A major designing problem was: how to eliminate the ear-splitting racket of jet engines starting up outdoors—highly distracting to employees involved in intricate manufacturing processes.

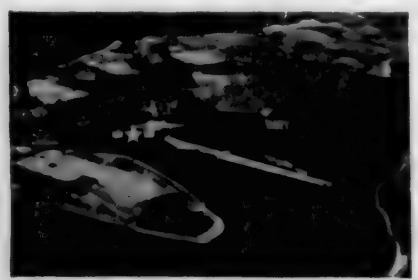
The solution: soundproofing—including double-paned, sealed-shut windows. And this posed an air-conditioning problem. For the factory, thus soundproofed, was virtually airtight!

To circulate fresh, conditioned air in a continuous cycle—and to exhaust heat, fumes, and stale air—a comfort-conditioning system was installed that, in effect, resulted in a factory that "breathes". . . a system built around American Blower Supply and Exhaust Fans, Air Conditioning Units, Sprayed Coil Dehumidifiers, Heating and Cooling Coils, Vaneaxial Fans, Venturafin Unit Heaters, and necessary accessories. This gave the Peconic Plant complete humidity and temperature control, providing maximum working comfort and efficiency.

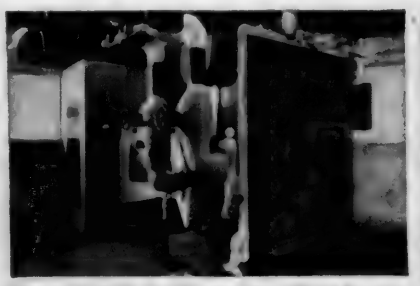
American Blower engineers are familiar with the special air-handling and air-conditioning problems of many industries. For assistance or technical data, contact our nearest U.S. or Canadian branch office.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary Corporation

AMERICAN BLOWER

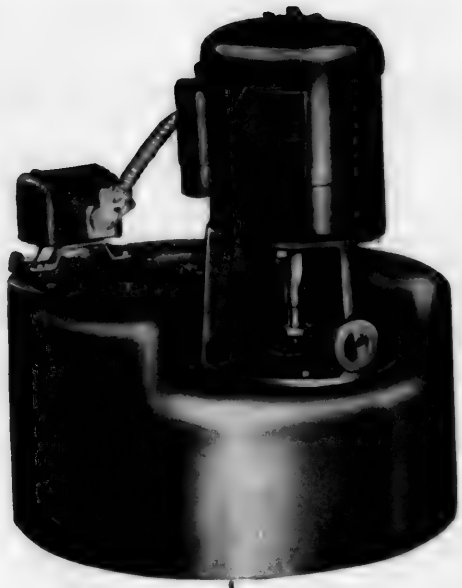


Deadly Grumman Cougar thunders over Long Island in test flight. Noise of jet take-offs dictated soundproof plant construction.



Pleasant indoor climate for offices in administration building is created by using American Blower Air-Conditioning Units.

Sixteen powerful American Blower Supply and Exhaust Fans circulate fresh outdoor air; exhaust stale air in continuous cycle.



For Top Performance - SKIDMORE HAS NO EQUAL!

"CV" VERTICAL PUMP
Single Unit

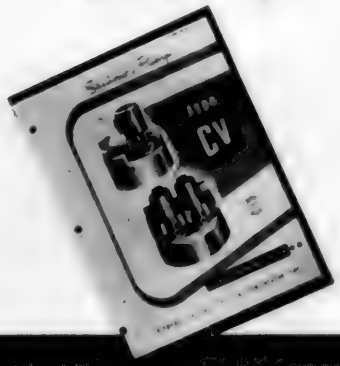
Duplex units are built with either the two float switches or automatic alternator.

The Skidmore "CV" Vertical Pump can do the job—in less space and at lower cost! Its top performance has earned the respect and confidence of the critical engineer and contractor. Pump is bronze fitted throughout . . . shaft is stainless steel . . . self-lubricating bronze bearing directly above impeller insures proper alignment and longer service

CHECK THESE ADVANTAGES

- Available in capacity range from 500 to 10,000 sq. ft. E.D.R. and discharge pressures from 10 to 40 lbs.
- No close tolerance or moving parts to wear — efficiency maintained.
- Inspected easily, without disturbing piping.
- Compact and rigid — requires only a space 15" x 15" x 22" for unit shown above.
- Receiver can be installed on floor level or in pit — has lowest possible receiver inlet opening.
- Cast iron receiver — for longer wear.

NEW BULLETIN
Complete engineering data and capacity tables are yours for the asking . . . send for bulletin No. 21.



SKIDMORE CORPORATION, ST. JOSEPH, MICHIGAN

QUALITY CONTROLS
for Air Conditioning and Refrigeration

The Sign of
QUALITY
MOTOR CONTROL

Allen-Bradley motor controls are a sound investment. Many years of experience in the field have made them "tops"—because they are good for millions of trouble free operations. Their silver alloy contacts need no maintenance.

All Allen-Bradley control is so designed that it can be neglected in service. It is one of the *big reasons* why this control is so popular in air-conditioning and refrigeration installations.

Specify Allen-Bradley . . . it stands for QUALITY.

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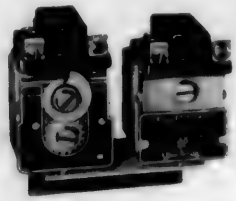
Bulletin 837 temperature control

Bulletin 836 pressure switch

Bulletin 800 3-way selector switch


High and low pressure cutout

Watertight pressure switch

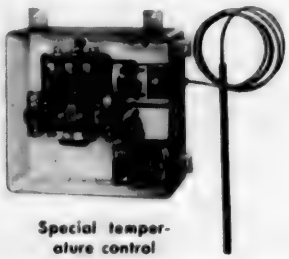
Bulletin 849 pneumatic timer

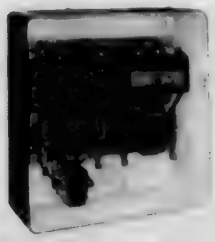
Bulletin 837 open temp. control

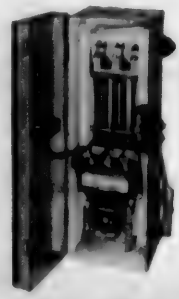
Bulletin 600 fractional hp starter

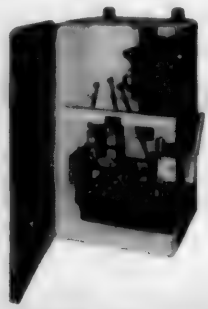
Bulletin 709 solenoid starter

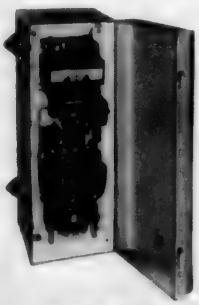
Bulletin 709 starter with selector

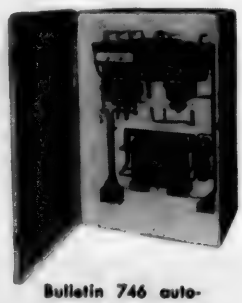

Special temperature control


Bulletin 736 automatic part-winding starter


Bulletin 640 manual stepless resistance starter


Bulletin 646 manual autotransformer starter


Bulletin 740 automatic resistance starter


Bulletin 746 automatic autotransformer starter

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

WHAM! and it's fastened in steel or concrete with the new Creary "330" Drive-It
VENTILATING DUCT HANGERS
fastened quick and sure in Houston, Texas with the new Creary "330" DRIVE-IT and Creary Drive Pins. Contractors everywhere are saving up to 80%, by using a Creary DRIVE-IT, the swift fastening method.

There's no easier operating or more dependable cartridge-powered fastening tool than a Creary DRIVE-IT.® The Creary DRIVE-IT was the first to introduce cartridge-powered tools into the construction field . . . to help contractors do a better and faster job of making fastenings in concrete and steel. You can do a 15 minutes' job in 15 seconds!

The new Creary "330" Drive-It® is designed for fast, easy operation . . . to help you speed up installation and reduce your on-the-job costs. *Send coupon below for more information.*

COMPARE THE NEW CREARY "330" DRIVE-IT® *for speed, convenience and dependability*

1. Snap-open action for fast loading and ejection. Greatest operating speed of any cartridge-powered tool.

2. Requires only one standard power load for all fastening jobs. No need to buy different strength cartridges for each job.

3. Automatic cartridge extraction when breech is snapped open. Gives more fastenings per minute.

4. Two cartridge-powered tools for light, or heavy jobs—new Creary "330" Drive-It (.25 cal.)—heavy-duty Creary "410" Drive-It (.38 cal.).

5. Safety in firing, as Drive-it must be pressed firmly against the work surface before tool can be fired.

6. Steel encased rubber guard completely surrounds work area; another of the many safety and convenience features which make Creary Drive-It the choice of contractors everywhere.

7. Barrel extension allows fastening in recessed areas such as junction boxes, deep channel iron, and other confined spaces.

8. Creary Drive-Pins are U. L. approved, will penetrate up to an inch of structural steel and withstood a 10,000 lb. pullout test by Pittsburgh Testing Laboratories.

the pioneer cartridge-powered fastening tool . . . .

POWDER-POWER® Creary Drive-It®

®TM Reg. U. S. Pat. Off.

WRITE FOR FREE CATALOG and Creary Drive Pin sample
Powder Power Tool Corp., 7536 S. W. Macadam Ave., Portland, Oregon

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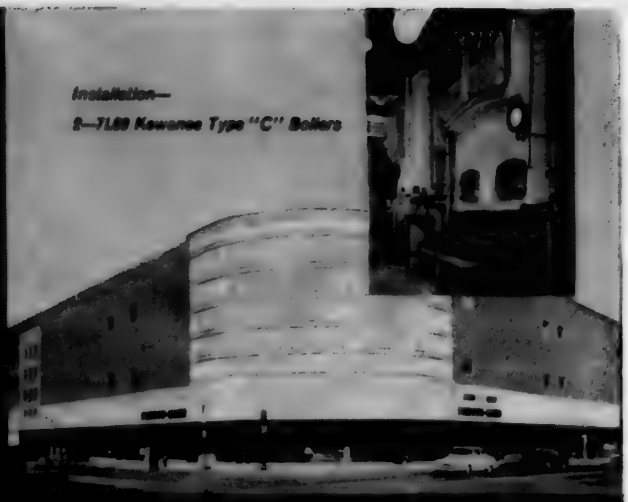
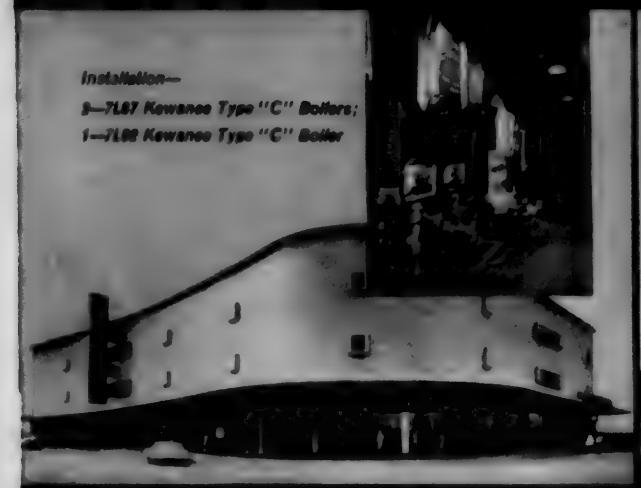
"Operating-Maintenance Costs Cut with Kewanee Boilers"

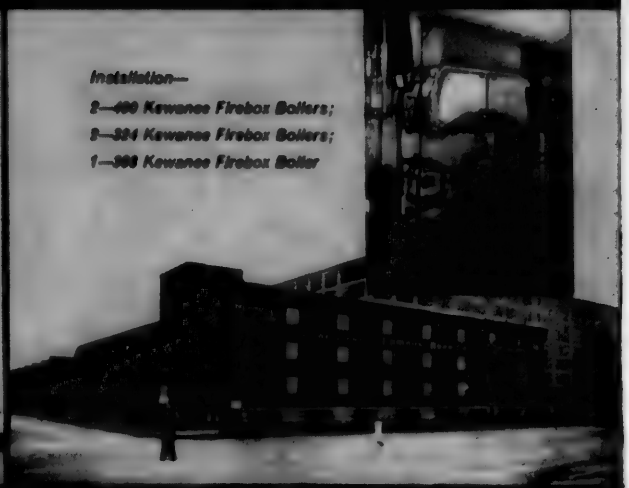
Noel Spannagel, Chief Engineer, Famous-Barr Company



Installation—
8—7L89 Kewanee Type "C" Boilers



Installation—
3—7L87 Kewanee Type "C" Boilers;
1—7L88 Kewanee Type "C" Boiler



Installation—
2—490 Kewanee Firebox Boilers;
3—324 Kewanee Firebox Boilers;
1—308 Kewanee Firebox Boiler

KEWANEE reserve plus rated boilers

...PREFERRED BY FAMOUS-BARR FOR OVER 1/4 CENTURY

Back in 1926 the Famous-Barr Company, St. Louis, installed 2 Kewanee Stoker Fired Boilers in a warehouse . . . so began an experience with Kewanee Boilers that has extended over the past quarter century. As they expanded, as new buildings called for more power, Kewanee was the preferred boiler installation every time. But let Noel Spannagel, Famous-Barr's chief engineer, tell the story:

"My previous experience proved Kewanee offered important savings in operating and maintenance as compared with other boilers." Famous-Barr long has known the advantages assured by Kewanee Reserve Plus Rated Boilers such as provision for expansion—"cruising speed" operation which lowers operating and maintenance costs and lengthens boiler life. So when you consider boilers, be sure they are rated on nominal capacity to operate at "cruising speed."

Don't be misled by promises that a boiler delivers steam to meet average daily requirements. Only a boiler rated on nominal capacity can guarantee performance beyond the call of usual duty.

YOU can depend on KEWANEE engineering

UNITS LIKE THESE...

BRING SAVINGS LIKE THESE...

- **In a New York skyscraper, Dorex Air Recovery eliminated the need for two large ducts up through 39 floors—saving valuable space as well as installation costs.**
- **In a Pittsburgh building, Dorex Air Recovery cut required air intake in half—saving some $47,000 on original equipment.**
- **In Chicago, a large industrial plant found Dorex Air Recovery so reduced required boiler capacity that over $40,000 was saved.**

BEST WAY to build your air conditioning and ventilating reputation is to offer a better installation that will save your customers money. You can do this by making Dorex Air Recovery part of your systems. The savings shown above are typical.

Dorex Air Recovery utilizes activated carbon to "manufacture" fresh air. Thus, intake of outside air can be reduced by as much as two-thirds—with corresponding savings in heating and cooling capacity.

Let us show you how Dorex can help improve your air conditioning and ventilating layouts. Write today for complete information. No obligation, of course. Connor Engineering Corp., Dept. B-95, Danbury, Conn.

CONNOR

dorex®

air recovery

Guaranteed TO SHUT TIGHT*

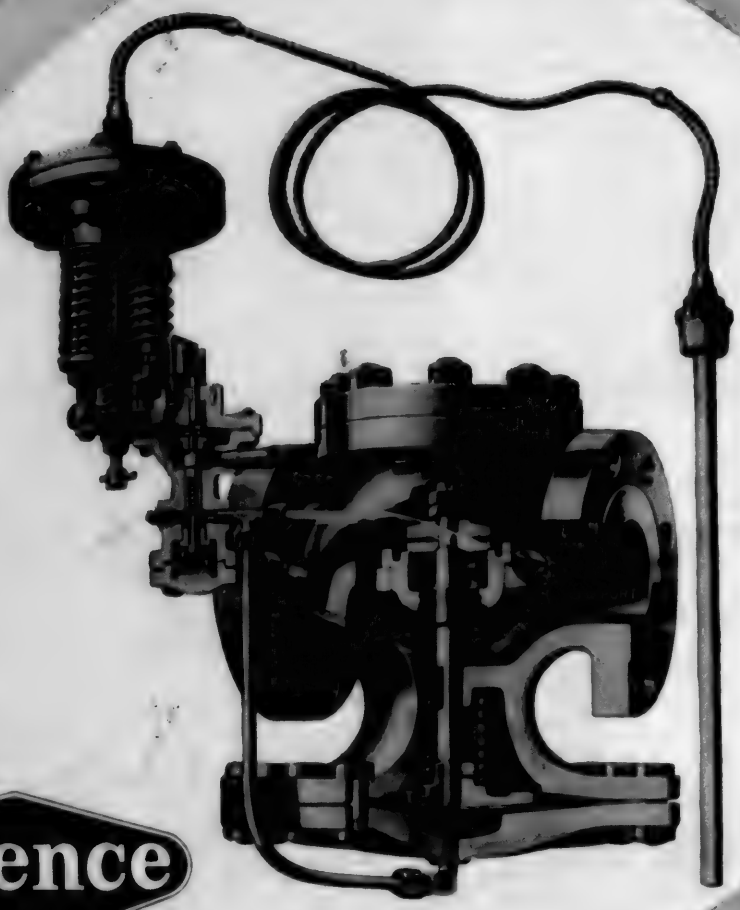
*When equipped with a SECO Metal Seat and Disc on steam service and protected by an approved Strainer, a Spence Regulator is guaranteed to shut tight when the demand for steam ceases.

Expensive steam leaks due to a lack of absolutely tight shutoff are eliminated in Spence Temperature Regulators. Here is why we can make such a guarantee:

First, our temperature regulators are of the single seat design. Seats and discs are made of durable SECO Metal. More than 20 years experience in thousands of installations has failed to produce a single case where SECO Metal has been cut by steam.

These plus other design features explain why Spence Temperature Regulators function dependably and accurately year after year without requiring expensive repairs or special attention.

Want more facts? Write for Bulletin T50 giving full details.



SPENCE
TYPE ET150
Temperature
Regulator

Spence

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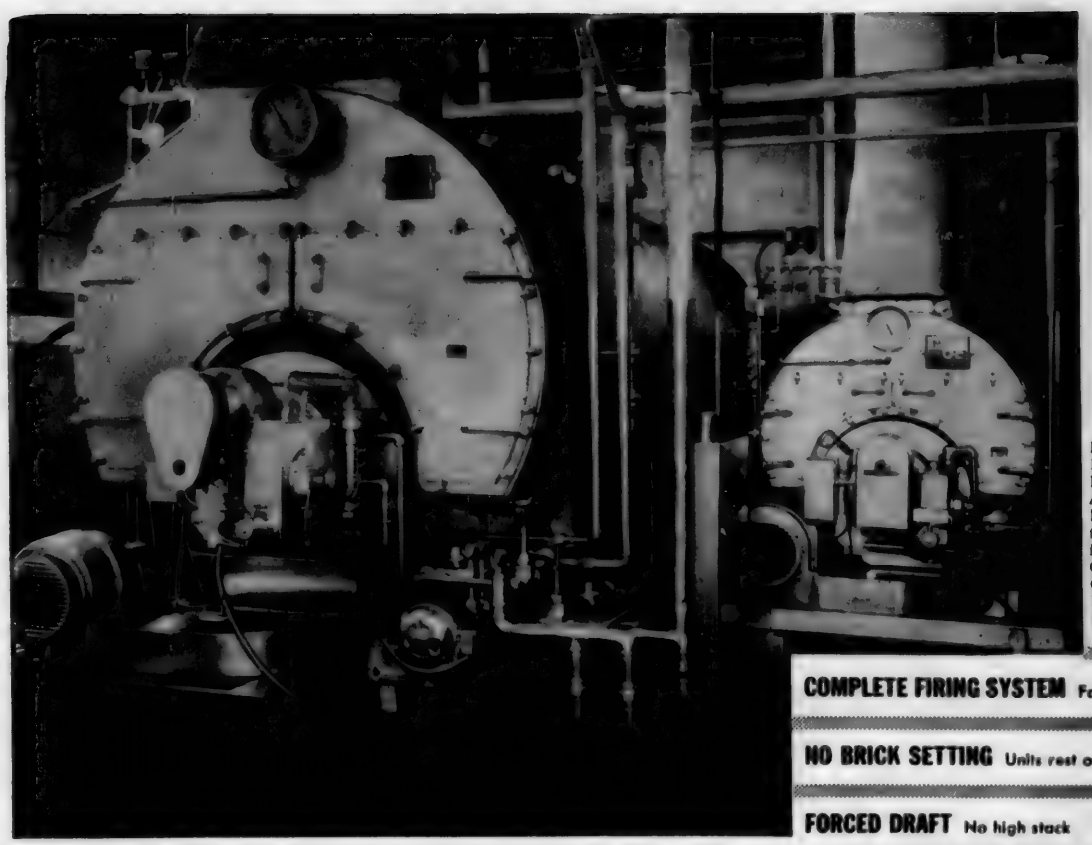
WALDEN, NEW YORK



Boiler room, Bendix-Skinner Division of Bendix Aviation, Detroit. Iron Fireman firing equipment installed by Comb & Groves. Giffels & Vallet, Inc., Consulting Engineers.

COMPLETE FIRING SYSTEM Factory Engineered

NO BRICK SETTING Units rest on floor

FORCED DRAFT No high stack

CONTROL PANEL Factory wired, tested

HIGH EFFICIENCY RATING Low fuel cost

FACTORY RESPONSIBILITY All components factory assembled

A *modern* steam plant

Integrated boiler burner units, with Iron Fireman forced draft firing

Iron Fireman-Kewanee boiler-burner units illustrated above are installed in the Bendix-Skinner (Division of Bendix Aviation) boiler plant, Detroit, Michigan. Burners and boilers were engineered together, as one unit. These complete boiler-burner units require only four field connections to put them in service—fuel, water, steam, and electricity. All components, including the entire electrical control system, are assembled at the factory.

Factory Engineered

Such a thoroughly engineered unit has many advantages for the owner beyond its inherent efficiency. Factory responsibility covers the entire job, with no separate contracts for boiler setting, boiler refractory, wiring, oil heating system, automatic control system, or forced draft air supply.

The rated capacity of these boiler-burner units (for either high or low pressure steam) allows an ample margin which can easily carry overloads of 50% or more. In other words, the normal rated load is carried without strain. This means low maintenance costs, and long life for both the firing unit and boiler. Steam pressure is steady, regardless of extreme load fluctuation. Five to one turn down ratio on firing unit offers a wide range for modulating fire control.

Burn oil or gas or combination gas-oil

With the dual-fuel burner you can burn either gas or oil, and switch from one fuel to another at a moment's notice. Or you can install either the oil burner or the gas burner, if you prefer to use one fuel exclusively. The Iron Fireman Oil Volumeter enables you to burn any grade of oil, from kerosene to the heaviest industrials, without special adjustment.

Add firing unit to your present boiler

The Iron Fireman forced draft firing system is a complete package in itself. It can be installed in practically any type of boiler with a minimum of on-the-job assembly.

Send for further information

Mail the coupon for detailed description of the Iron Fireman forced draft firing unit, or get in touch with your Iron Fireman dealer.

Iron Fireman®

AUTOMATIC FIRING EQUIPMENT
FOR GAS, OIL, COAL

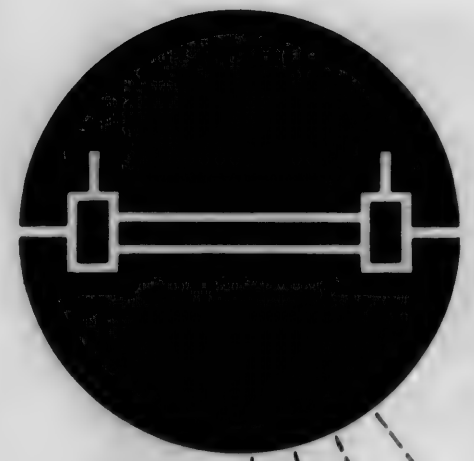
IRON FIREMAN MANUFACTURING CO.
1068 W. 106th Street, Cleveland 11, Ohio.
In Canada, write to 80 Ward Street, Toronto, Ontario.

Please send detailed information on Iron Fireman forced draft firing units for oil, gas and combination gas-oil firing.

Name_____

Address_____

City_____ State_____



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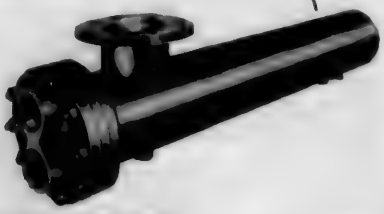
to get the most
out of heat exchange...

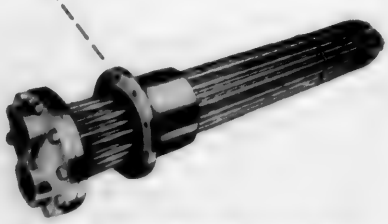
A DEPENDABLE LINE OF INDUSTRIAL FLUID HEATERS

Here's the efficient answer to your industrial and commercial fluid heating requirements . . . GENERAL Heat Exchangers. You can be sure of long, troublefree service at low cost—backed by 25 years' engineering and manufacturing experience in fluid heating equipment. Get the complete story for your next installation, whether it's new construction, modernizing, or expansion. Write for Catalogs. General Fittings Company, Box 151F, East Greenwich, Rhode Island.

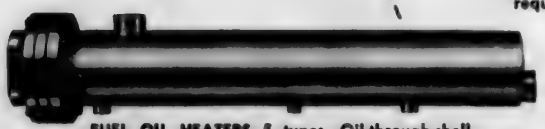
INSTANTANEOUS WATER HEATERS Modern hot water supply for plant wash rooms, processes, cafeterias, hospitals, and other industrial, commercial, or institutional needs.



CONVERTERS 54 sizes steam-to-water. 20 sizes water-to-water (baffle type). Capacities to 900 g.p.m.



TANK-HEATING UNITS 54 sizes for all requirements.



FUEL OIL HEATERS 5 types. Oil-through-shell or oil-through-tubes, for use with steam or boiler water — discharge or suction side of oil pump — U-tube or straight tube.

GF GENERAL FITTINGS COMPANY

TANKLESS AND INSTANTANEOUS WATER HEATERS AND HEAT EXCHANGERS

RALPH KROEHLE, PRESIDENT THE PEERLESS ELECTRIC COMPANY

"...THE BEST BLOWER ENGINEERING..."

● Peerless engineers work under orders to give every fan and blower "the best possible engineering." Our engineering standards now meet or exceed all industry codes. The reason is simple.

COMPLETE ENGINEERING—Peerless builds its own motors and job matches them to meet blower requirements. They have the advantage of being one complete unit, tested thoroughly for motor characteristics, speed and drive alignment.

HEAVY CONSTRUCTION—Peerless frames and housings are better and of heavier construction than any competitive products. Construction is all-welded. The result is a vibration-free unit.

NAFM APPROVED—Peerless Backward Curve Belt Drive Utility Blowers in sizes from 12½" to 36½" meet all NAFM recommendations. They have self-limiting horsepower characteristics and dynamically balanced wheels with matched spun cones. There is nothing in the air stream. Operation is exceptionally quiet.

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AIR HANDLING BY NAFM

PERFORMANCE DATA—Complete data on Peerless fans and blowers is cataloged for easy reference. Bulletin SDA-160 shows all fans and forward curve blowers. Bulletin SDA-200 gives all data on backward curve blowers (NAFM) from 12½" to 36½". Use the coupon below to get your file copy. Dimension prints are available on request.

THE PEERLESS ELECTRIC CO.
WARREN, OHIO

☐ Send me Bulletin SDA-160.
☐ Send me Bulletin SDA-200.

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TITLE .....
COMPANY
ADDRESS

Peerless Electric

FAN AND BLOWER DIVISION
THE PEERLESS ELECTRIC COMPANY
1400 W. MARKET ST. • WARREN, OHIO
FANS · BLOWERS · MOTORS · ELECTRONIC EQUIPMENT

JOSEPH P. SPANG JR. *Portrait by Fabian Bachrach*

"A majority of the employees at Gillette..."

"The United States Savings Bonds program is good for the personal security of the bond buyer—good for the security and economy of the Country. A majority of the employees at Gillette Safety Razor Company purchase Savings Bonds the payroll savings way. Under this plan they find it easy to save a tidy sum for retirement years, to pay that unexpected bill, or meet the expense of other emergencies that arise."

JOSEPH P. SPANG JR., ***President***
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If less than 50% of your employees are enrolled in the Payroll Savings Plan . . . if you have not conducted a person-to-person canvass in the past two years *(or if you do not have the Plan)*, act now! Telephone, wire or write to Savings Bonds Division, U. S. Treasury Department, Washington, D. C. You will hear promptly from your State Director, who will be glad to help you conduct a person-to-person canvass that will put an application blank in the hands of every employee. That is all you have to do. Your employees will do the rest. They want to save for their personal security.

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APPROVED RATINGS—as established by Institute of Boiler and Radiator Manufacturers for finned-tube and baseboard radiation.

FULL GUARANTEE—top-quality Sarcofin products, backed up by a *1-year guarantee* against defects in materials and workmanship. Heating elements *guaranteed* for maximum working pressures.

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UNDIVIDED RESPONSIBILITY—the protection and convenience assured by obtaining from *one* "Complete Line" source...SARCO-SARCOTHERM... not only Sarcofin finned-tube and baseboard radiation but also heating specialties for steam and hot water, condensation and vacuum pumps, temperature regulators, and weather-compensated control systems for steam and hot water heating.

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Empire State Building, New York 1, N. Y.

Please send me:
- ☐ 32 page Bulletin No. 1650 on Sarcofin Finned-Tube Radiation.
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- ☐ Also information on _____

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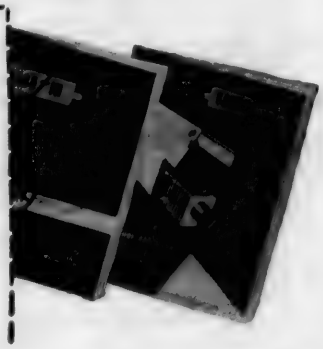

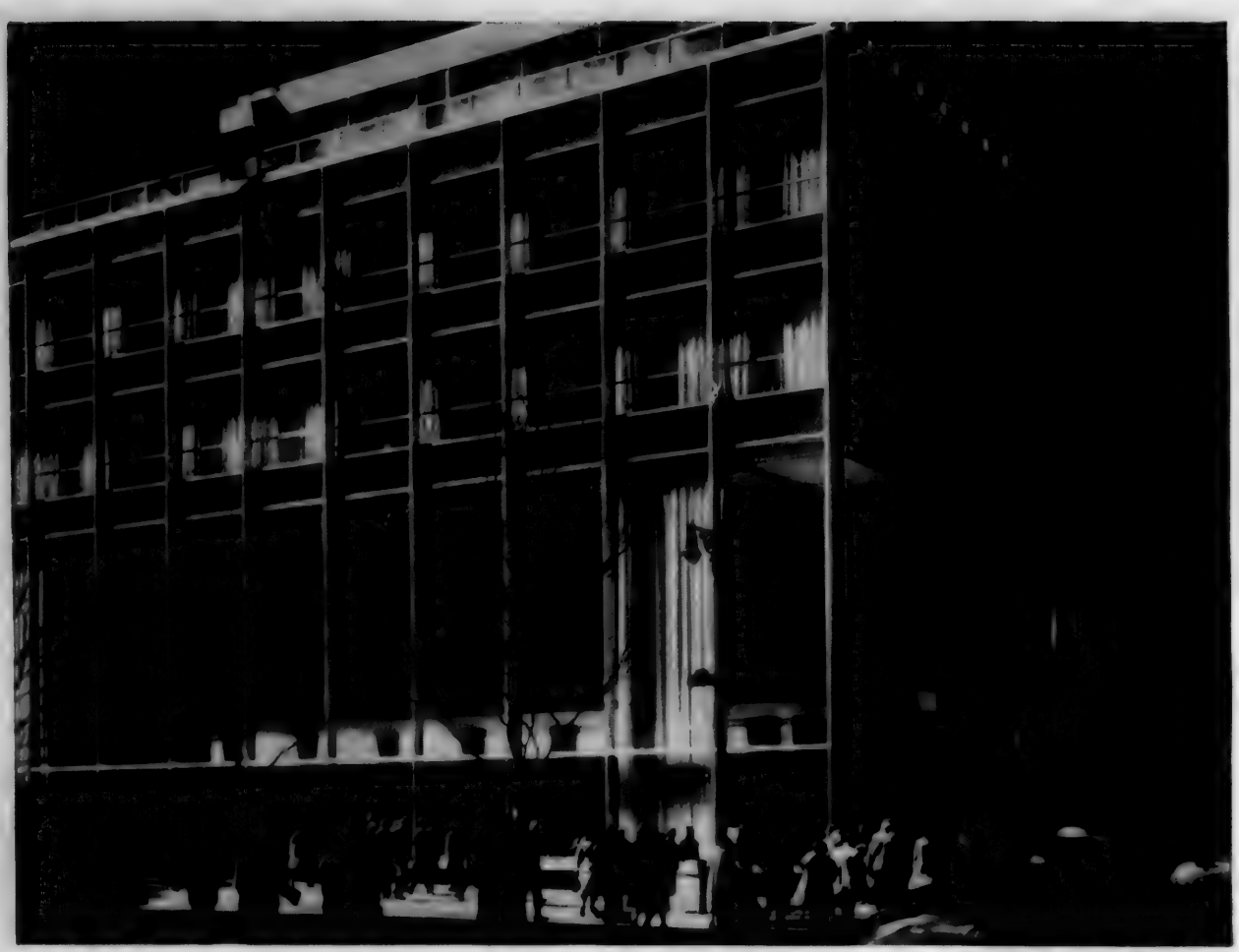

GLASS-SHEATHED Manufacturers Trust Building in New York is fully air conditioned by a Worthington central station system.

New "glass bank" air conditioned by Worthington

TWO 150-TON Worthington packaged water chillers in basement handle entire cooling for new bank building.

Polished aluminum and the largest panes of glass ever made in this country highlight this striking new building housing the Fifth Avenue office of Manufacturers Trust Company.

This vast expanse of glass posed a tough air conditioning problem. The job is taken in stride, however, by a modern Worthington central station system consisting of two 150-ton packaged water chillers. These chillers circulate water to a central air distribution system; from there, cool, filtered, dehumidified air is sent throughout the building.

For over half a century, Worthington air conditioning installations have been serving business and industry. Today, the complete Worthington line is ready to meet any assignment, large or small. Get in touch with your nearest Worthington district office or write to Worthington Corporation, Section A.5.20-V, Harrison, N.J. A.5.20

WORTHINGTON

CLIMATE ENGINEERS TO INDUSTRY, BUSINESS AND THE HOME

Propeller type ventilating fans deliver large volumes of air at low resistance and low current consumption. All wheels are machine balanced for smooth, vibrationless operation. Made in 2 types and 10 basic sizes to cover a wide range of industrial applications. Pressed steel panels provide rigid support and simplify installation. Totally enclosed motors mounted in heavy welded wire safety guard. Wheel diameters from 10 inch to 48 inch. Direct or belted drive. Capacities from 610 cfm to 24,200 cfm. Penthouses for roof installation of **nyb** Propeller Fans can be furnished in 6 sizes. Louvers open and close automatically to protect fan against the weather. Separate louvers for wall mounting also available.

Write for Bulletins

All New York Blower Company products are laboratory tested, accurately rated and fully guaranteed in strict accordance with Standard Test Codes.

THE NEW YORK BLOWER COMPANY

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FACTORY, LAPORTE, INDIANA

Airtemp Dealers Handle a Complete Line

Packaged Waterless (Air-Cooled) Air Conditioners—no water needed, no plumbing required. 2, 3, 5 and 7½ H.P.

Packaged Water-Cooled Air Conditioners in 6 models, from 2 to 15 H.P.

AIRTEMP'S leadership assures your success!

More Airtemp "Packaged" units have been sold than any other make!

Airtemp pioneered "Packaged" air conditioning 18 years ago. This leadership and experience is bringing greater sales to dealers *today!*

You sell more—because you get continuous help from your Airtemp *Distributor!* As a "Packaged" air conditioning specialist, he's familiar with your problems and can help you solve them *fast!*

You sell more—because you represent the *trusted Chrysler name!* Your customers put their confidence in the high engineering standards of Chrysler Corporation.

You sell more—because you're backed by *powerful merchandising!* Strong national advertising combined with local-level promotion brings in more customers.

You sell more—because of *exclusive Airtemp features!* Special exclusive features give your customers more for their money...and make selling Airtemp easier for you!

For full details on all of the advantages of an Airtemp Packaged Cooling Franchise, write to: Airtemp Division, Chrysler Corporation, Dayton 1, Ohio.

"the line that pays"

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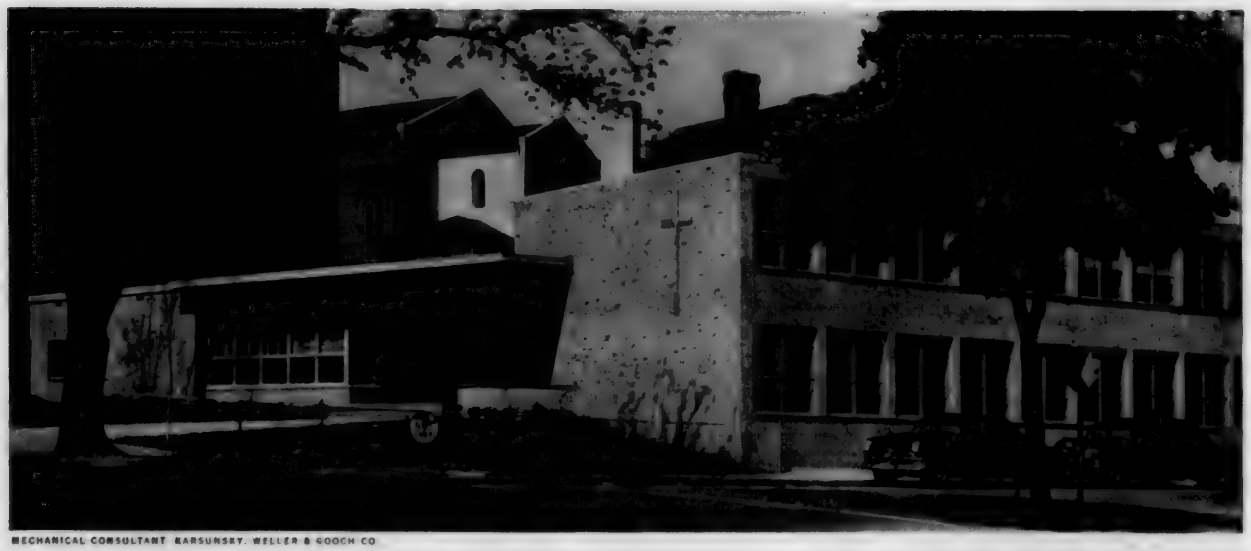
DIVISION OF CHRYSLER

AIR CONDITIONING • HEATING FOR HOMES, BUSINESS AND INDUSTRY



MECHANICAL CONSULTANT KARSUNSKY, WELLER & GOOCH CO.

Holy Redeemer School Installs and Insulates 115-Foot Steam Line with Gilsulate® in 24 Man-Hours

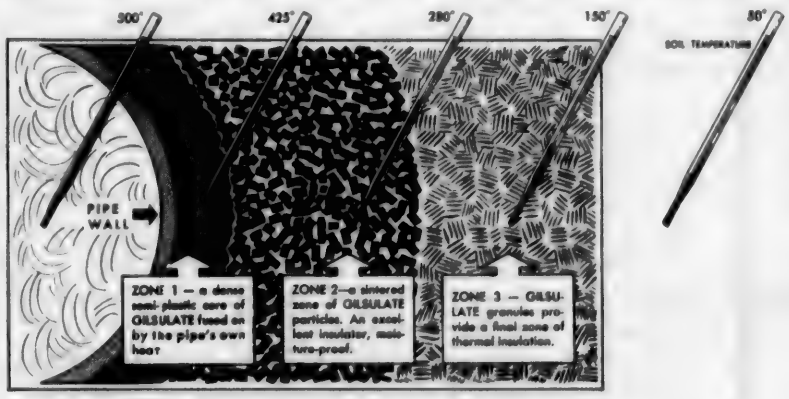
LOW-COST INSTALLATION HAS LIFETIME PROTECTION AGAINST HEAT LOSS AND CORROSION

Here's more proof that GILSULATE can save money for *you*—even on *small* as well as large jobs.

The Holy Redeemer School, Washington, D. C., recently installed 115 feet of 5-inch and 1¼-inch pipe for steam lines and return into their new 16-classroom building. Only 3 men were employed on the job. The installation was made in a trench 6 feet deep. The GILSULATE, after being wheeled to the top of the ditch, was skidded down and poured into forms around the pipes.

Total time for the *complete* job—including form construction, pouring 6½ tons of GILSULATE, and backfilling—was 24 man-hours. No other method for insulating and protecting hot underground pipes can match this performance—*Triple-Zone* GILSULATE *shows the lowest installed cost providing efficiency and permanence.*

Investigate the value of this easily installed, low-cost GILSULATE. Use the coupon below for complete information, or see your local GILSULATE distributor.


300°
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SOIL TEMPERATURE
PIPE WALL
ZONE 1 — a dense semi-plastic cave of GILSULATE fused on by the pipe's own heat
ZONE 2—a sintered zone of GILSULATE particles. An excellent insulator, moisture-proof.
ZONE 3 — GILSULATE granules provide a final zone of thermal insulation.

Facts about Gilsulate

1. *Easy to use*—just pour, tamp and backfill... pipe heat does the rest.
2. *Forms 3 zones* of protection against heat loss and all hazards commonly encountered by hot buried pipes.
3. *Needs no housing or mechanical sheaths:* no mixing, special handling or equipment.
4. *Only needs normal pipe spacing:* for multiple pipe or cramped conditions.
5. *Three types available:*
   Type A for 220°-310° F. temp. range
   Type B for 300°-385° F. temp. range
   Type C for 385°-520° F. temp. range

THE TRIPLE-ZONE INSULATION FOR LIFETIME PROTECTION OF HOT UNDERGROUND PIPES

GILSULATE®

AMERICAN GILSONITE COMPANY, SALT LAKE CITY 1, UTAH
Affiliate of Barber Oil Corp. & Standard Oil Co. of California

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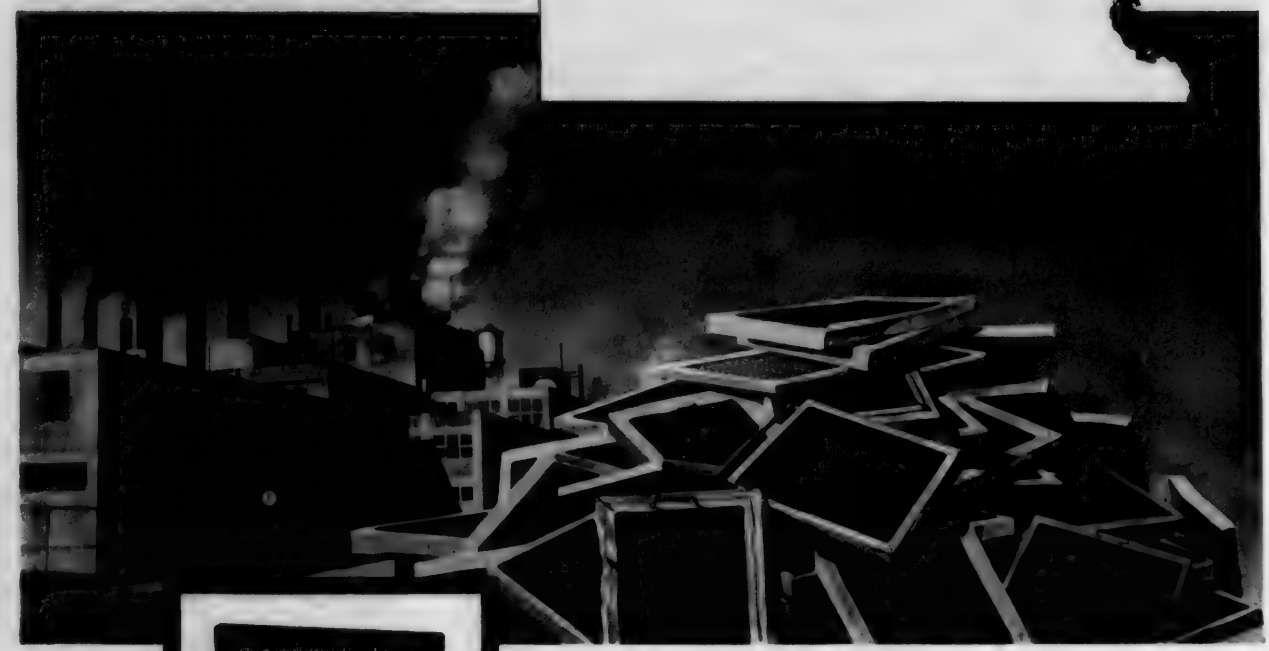
HERE'S THE SEQUEL TO "...or equal"



Standard 2" FAR-AIR Panel Filter.

Send for your copy showing complete specifications on the FAR-AIR line of quality filters.

When you see this specification..."FAR-AIR® filters or equal" remember that these filters *have no equal.* Substitutes mean contributions to the junk pile and higher eventual costs, so it pays to install the finest—FAR-AIR.

In FAR-AIR you get filters that handle more air with greater efficiency. Because of their greater dirt-holding capacity, you save up to 60% in maintenance. The "lifetime engineering" of FAR-AIR filters with their heavier frames, reinforcing rods and other features, insures that each unit will continue to operate with replacements virtually eliminated.

Yes, you'll want to use FAR-AIR filters eventually, so why not install them initially. Write for complete catalog information to FARR COMPANY, P.O. Box 45187, Airport Station, Los Angeles 45, California.

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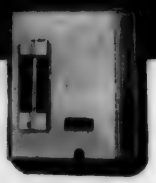

JOHNSON-CONTROLLED HEAT PUMP

Insures Ideal Comfort, Cuts Heating and Cooling Costs

Year 'round air conditioning for the award-winning Roanoke Public Library* is accomplished by an application of the reverse cycle heat pump, utilizing two 40-ton refrigeration compressors. The installation is one of the first of its kind in a library building.

Precision control of this modern air conditioning system is provided by a specially engineered system of Johnson Automatic Temperature Control. Strategically located Johnson Heating-Cooling Thermostats maintain refreshing, even temperatures throughout each of the nine zones into which the building is divided. Behind the scenes, other Johnson Thermostats, Valves and related apparatus constantly keep the system in balance with outdoor temperatures.

Whether it's the spacious main reading room, a filled-to-capacity auditorium or one of the many smaller special activity rooms, there is constant comfort to satisfy the occupants. Control is so perfect that occupants never feel the need for more or less heating or cooling.

Operation of the system is completely automatic, including all heating and cooling, defrosting and indexing of the room thermostats. Added to the comfort and convenience features of Johnson Control are equally important economy advantages. The efficient control of this heat pump installation results in virtually waste-free heating and cooling performance!

Whatever your control problem—whether it involves a new or existing building, a simple or intricate system—it can be solved best by Johnson. Why don't you take advantage of the more than 70 years' experience of the nationwide Johnson organization? An engineer from a nearby Johnson branch will gladly make recommendations without obligation. JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.

*Roanoke Public Library, Roanoke, Virginia. Frantz & Addkison, architects, Roanoke; Wiley & Wilson, mechanical engineers, Lynchburg, Virginia; R. H. Lowe, air conditioning contractor, Roanoke.

JOHNSON CONTROL

TEMPERATURE ↕ AIR CONDITIONING

PLANNING • MANUFACTURING • INSTALLING • SINCE 1885

Wagner®
ELECTRIC MOTORS
...the choice of leaders in industry

WAGNER offers something NEW in small motors

More compact capacitor-start and split-phase motors—¼ hp and below—*that help the design engineer in a tight spot!*

For design engineers who've been looking for more efficient fractional horsepower motors with less bulk... here's good news!

Now, you can get smaller, more compact Wagner capacitor-start and split-phase fractional horsepower motors with many new added features such as *a new endplate design, a new lubrication system that permits all-angle mounting and a new terminal board and switch location.*

Yet these re-designed motors retain all of the proven features that have made Wagner motors famous for quality for more than 60 years. Bulletin MU-200 gives complete information—write today for your copy.

When you specify Wagner Motors—you get the advantage of a liberal warranty... of nationwide service facilities, with on-the-spot service, replacement motors and parts available from 25 Wagner-owned Service Branches and more than 850 Authorized Service Stations. You can choose from a wide variety of types and sizes—singlephase or polyphase—from 1/25 to 400 horsepower.

Inside view of sleeve bearing endplate with seal removed to show felt packing used for lubrication. In addition to the continuous strip, a spring-loaded piece of felt makes constant-pressure contact with the shaft through an opening in the top of the bearing.

View of the type RK motor with endplate removed showing terminal board on which thermal protector and quick-break switch are mounted. Note thickness of steel frame which has been machined for accurate endplate fit. Rigid base is welded directly to the frame.

Wagner Electric Corporation
EST. 1891

Wagner Electric Corporation
6462 Plymouth Ave., St. Louis 14, Mo., U.S.A.

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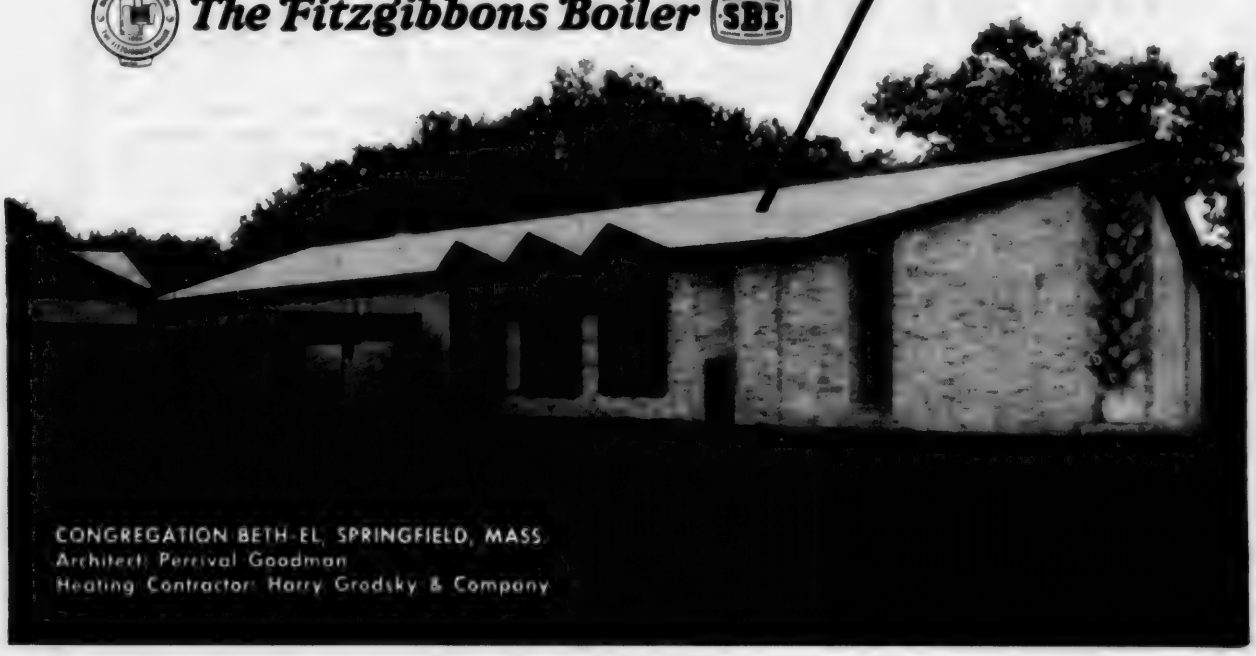
Modern Fitzgibbons heat...

for a distinctive religious building

FITZGIBBONS "D" TYPE FIREBOX BOILER is a wise choice for heating big buildings everywhere. From an engineering standpoint, it makes an extremely efficient installation with simple, trouble-free operation and maintenance. From an operating or owner point of view, the outstanding fuel economy of the "D" Type Firebox Steel Boiler makes it particularly attractive. The Fitzgibbons "D" Type Bulletin gives complete information. Write to the Fitzgibbons Boiler Company, Inc., 101 Park Avenue, New York 17, N. Y. Ask for Catalog AR-5.

The Fitzgibbons Boiler SBI



CONGREGATION BETH-EL, SPRINGFIELD, MASS.
Architect: Percival Goodman
Heating Contractor: Harry Grodsky & Company

THIS NEW VACUUM HEATING PUMP

HAS THE INCREASED AIR CAPACITY EFFICIENT HEATING PRACTICE DEMANDS

It's the Nash CSM

Designed and manufactured by the organization that made the Jennings Manifold Heating Pump standard of the Heating Industry, the new CSM incorporates every desirable feature architects, engineers, owners and operators have sought. Employing separate air and water pump elements, each with its own motor and each independently controlled by its own automatic switch, the capacities and arrangement may be widely varied to meet job conditions. For the first time, the engineer has the choice of realistic water and air capacities required for rapid system response without wasteful overheating.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

NASH ENGINEERING COMPANY

437 WILSON, SO. NORWALK, CONN.

Methods of Joining Plastic Pipe

WALTER E. JACOBSON

General Manager, Yardley Plastics Co., Columbus, Ohio

An article by Mr. Jacobson on Facts About Plastic Pipe was published in ACH&V January, 1955. In his latest article he describes the various fittings and methods now used to join flexible, semi-rigid and rigid plastic pipe.

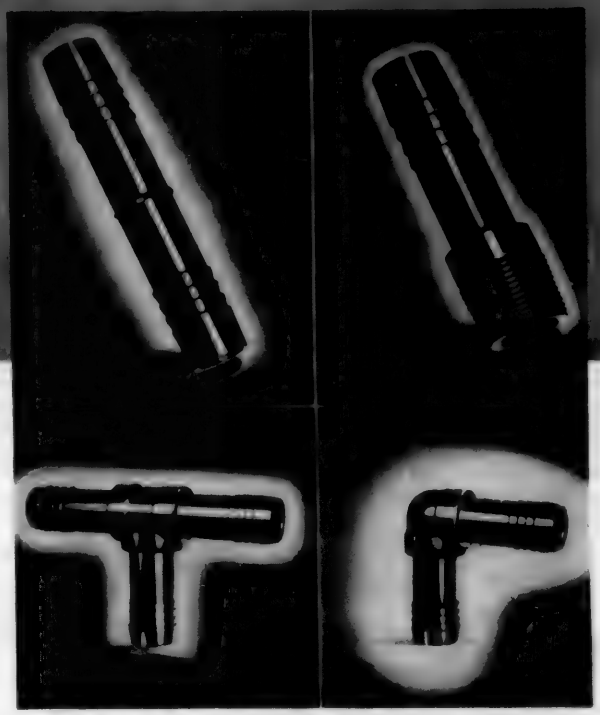


Fig. 1. Insert fittings for polyethylene pipe, illustrated are the insert thread adapter, insert coupling, insert tee and ell.

PLASTIC pipe is made in two general categories, flexible, and rigid or semi-rigid. The principal materials used in these categories are:

Flexible—Polyethylene

Semi-rigid—Cellulose acetate butyrate
Vinylidene chloride

Rigid—Polyvinyl chloride
Styrene acrylonitrile copolymer
Fiberglass reinforced polyester

Semi-rigid and rigid plastic pipes use the same type fittings and we can classify them, therefore, in two general groups.

The physical characteristics of plastic pipes control the design of fittings that are to be used with them.

Insert Fitting for Polyethylene

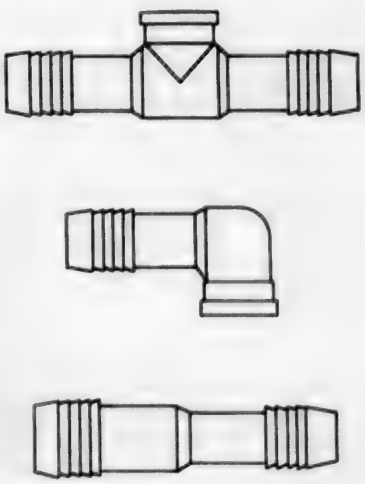
There is, however, no satisfactory solvent cement for polyethylene. This eliminates the possibility of a solvent welded fitting. Therefore, an insert type fitting was developed. Since polyethylene is comparatively soft, it is not suitable for an insert fitting. A dissimilar material had to be used. Three kinds of plastic materials have been used with good results: High impact styrene compounds, styrene acrylonitrile copolymer, and nylon. The first two are the most widely used materials. They have excellent impact strength, good chemical resistance, and are generally very tough. The millions of fittings manufactured and sold testify to their serviceability.

Insert fittings made of nylon, for particularly severe operating conditions, have also been sold in limited quantities. Sales of nylon fittings are limited because of higher cost.

Hose type clamps are used with insert fittings to make leakproof joints. The polyethylene, being comparatively soft, is readily tightened around the fitting insert with normal screw tension on the clamp. In the larger diameters and in heavy duty pipe, which have wall thicknesses of the order of 0.250 in., it is advisable to double clamp all fittings. Clamps are made in all stainless steel, and a combination of stainless steel band and rustproofed steel screw and housing assembly. Fitting and pipe manufacturers strongly recommend the all-stainless clamps. Less widely used are strap or wire clamps requiring special tools for installation.

A wide variety of insert fittings is available. Being flexible and made in long lengths, polyethylene pipe needs fewer fittings than rigid pipe. Nevertheless, fittings for almost any installation requirement are available, such as adapters, couplings, ells, tees and crosses. Figure 1 illustrates some of the principal fittings being manufactured. In addition, there is a long list of special fittings, some with reductions on one opening, others with special adaptions such as male or female thread for one opening, and special purpose fittings such as well-seal ells. Figure 2 shows a few of these special fittings.

Fig. 2. A few special purpose fittings.



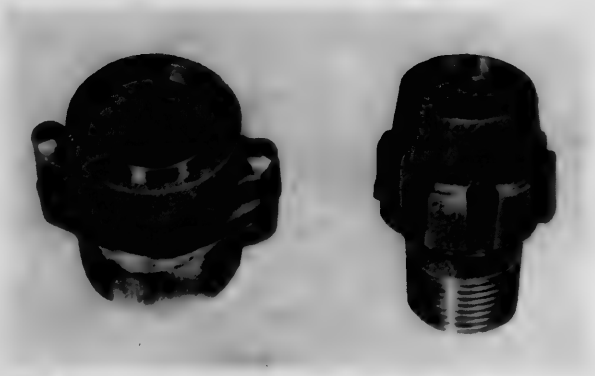


Fig. 3. One design of a compression type fitting.

Metal Fittings

Metal, too has a part in the plastic pipe fitting picture. Brass insert type fittings have had wide use in installations where exceptionally severe operating conditions existed. Galvanized steel insert fittings are also manfactured. In addition to the insert type successful compression type fittings have been developed. One of these is illustrated in Fig. 3. Cost is a limiting factor with metal fittings particularly those of non-ferrous metal. The advantages of a complete plastic system place restrictions on expanded use of metal fittings.

Fig. 4. Slip type fittings are available to provide a complete polyethelyne system.

Dissimilar Materials

Because of dissimilar plastic materials in insert fittings and flexible pipe, care must be used in designing a piping system for anything other than a cold water installation. The reaction of polyethylene pipe and that of fittings of other materials will not be the same to all chemicals or industrial fluids.

Polyethylene can be welded with hot air welding guns using a polyethylene welding rod. The welding technique can be readily learned. Slip type fittings and flanges for bolted joints are available so that a 100% polyethylene system can be designed. A slip type fitting is illustrated in Fig. 4.

Three Groups of Fittings

Threaded, slip sleeve and flanged fittings are made for rigid and semi-rigid plastic pipes. Conventional threaded fittings come in standard iron pipe sizes. Threaded plastic fittings are entirely satisfactory and provide a simple method of joining plastic pipes that is well understood by all installation people. Manufacturers stress the need to hande plastic pipe and fittings more carefully than steel and strap wrenches are recommended to avoid surface marks. Thermoplastic material has a tendency to flow under the pressure exerted in tightening a threaded fitting. This generally eliminates the need for sealing compounds.

Slip sleeve fittings, using suitable solvent cement for a welded joint, is the other principal type of fitting used with rigid and semi-rigid plastic pipe. This, too, is a simple and easily learned method of joining. It is essential to use suitable solvent cement and the manufacturers' recommendations should always be followed. Instructions in applying solvent cement to fittings and assembling fittings to pipe should be carefully followed. Too little solvent cement will result in a leak or, at best, weak joint, whereas too much solvent cement may adversely affect the physical characteristics of the pipe or fittings. Solvent welded fittings require greater care in installation and cannot be disassembled, but they do provide the great advantage of utilizing lighter wall pipe.

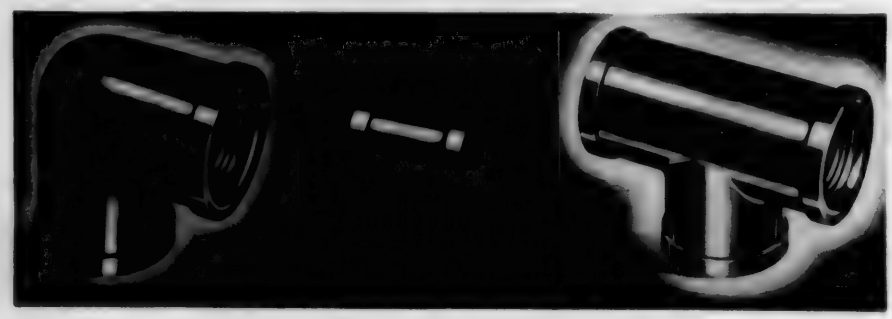
Solvent cement type fittings are made in the same range of sizes and the same types as threaded fittings. Plastic pipe is made in I.P.S. outside diameters and also in "solvent welded pipe" outside diameters. This latter is a dimension standard adopted by the plastic pipe industry. Cement type fittings are generally available for both schedules. Figure 5 illustrates such commonly used fittings. Slip sleeve fittings have a tapered fit and will accommodate pipe, which may vary slightly from nominal in its outside diameter dimensions.

Flanged fittings are available for rigid pipes. Threaded plastic fittings may have a tendency to stick when installed for sometime and manufacturers, therefore, recommend flanged fittings. Such a recommendation is particularly valid in industrial installations of larger diameter pipes.

Fiber glass reinforced polyester pipe uses fabricated fittings of similar materials. They are assembled to pipe by cementing.

(*Concluded on page* 146)

Fig. 5. A group of threaded fittings for plastic pipe.



Use of Temperature Controls for House Heating Boilers

H. L. MOHN

Project Engineer, York-Shipley, Inc., York, Pa.

During the past few years, nearly 20,000 installations were made using the fixed setting temperature control system described. Part I of this two-part article covers factors of design and design problems plus the type and location of boiler controls.

PROBLEMS regarding control of house heating boilers, as applied to various types of radiation systems, have been of much concern to heating contractors. The decision of what type controls to use and where to put them on the boiler has always been a compromise because of various factors involved.

During the early days of automatic firing, boilers were generally used with cast iron radiation fed by gravity flow. In this type of system, a simple room thermostat and surface type high limit boiler temperature or pressure control were adequate.

Improvements in hot water house heating systems were then accomplished by the addition of pumps to provide forced circulation. Heat supply to the house was usually controlled by operating the pump and the oil burner simultaneously on room thermostat demand, but no attempt was made to maintain boiler standby temperatures between house heating cycles.

In seeking to eliminate over-ride in this type of system, the weighted disc flow control valve was developed to prevent the continuation of circulation by gravity after the room thermostat was satisfied. By also adding a boiler operating control, usually of the immersion type, the boiler could be maintained at a nominal standby temperature of approximately 180 deg F between house heating cycles without extending room temperatures.

Immersion Coils

This not only made it possible to keep a ready supply of heat available in the boiler for house heating, but it also prompted engineers to use the house heating boiler as a source of heat for domestic hot water. It led to the development of tank heating coils for immersion in or external attachment to the boiler, which heated domestic water at a relatively slow rate for storage.

Although this required the availability of hot boiler water 24 hours a day both summer and winter, accurate control of boiler temperature was not too important in maintaining suitable domestic hot water temperatures because of the heat storage capacity of the tank.

Use of Tankless Coils

This type of system gradually gave way to the use of tankless heating coils which provide instantaneous hot water more economically without the need of storage tanks. However, greater accuracy is required of the boiler operating controls when domestic hot water is supplied by this method. At this point the house heating boiler industry recognized that operation of a tankless coil system could be successful if heat input to the boiler were diverted 100% to the heating of domestic hot water whenever there was a demand for it.

Control circuits for hot water boilers were developed in which operation of the circulating pump for house heating is interrupted temporarily whenever boiler temperature drops too low to assure an adequate supply of hot water.

In steam boilers the diversion of heat to the tankless coil is simple. A demand for domestic hot water immediately chills the boiler water below its boiling point, thus interrupting flow of heat to radiation.

These systems were generally practical with conventional immersion boiler controls as long as the boiler water content was at least 30 gallons and the output capacity of the boiler was at least 150 Btu per hr. Combined heating input rates and boiler sizes of this order had the capacity to produce and store enough heat in the boiler to meet the priority requirements for domestic hot water even though the immersion controls were relatively slow in responding to divert boiler operation from house heating to domestic water heating.

Design Problem

In present day small homes, where space allotted for the heating system has been reduced to the point where boilers of this large size are impractical, a revision of thinking was necessary. The specification presented to York Shipley, Inc., by Levitt & Sons, builders of Levittown, Pa., called for a heating and domestic hot water system including a boiler unit complete with tankless coil, burner, control system, expansion tank, circulating pump all enclosed in a jacket 25 in. deep, 30 in. wide and 36 in. high. Obviously a boiler having a water content of 30 or more gallons with sufficient heating surface to absorb heat at a rate of 150,000 Btu per hr could not possibly be compacted into this space.

Preliminary design showed that a boiler having a capacity of 92,000 Btu per hr with a water content of 19 gal could be produced to fit this space. However, the question of getting an adequate supply of domestic hot water from a boiler this size posed a new problem.

H. L. Mohn worked as a journeyman plumber and steamfitter for seven years before studying at the University of Wisconsin where he received a B.S. in Mechanical Engineering in 1934. For the next six years he was research and development engineer for Fitzgibbons Boiler Company, Inc., and from 1940-44 was chief engineer for Milton Manufacturing Company. For the next two years he returned to Fitzgibbons as chief engineer. Since 1946 he has been project engineer in charge of residential equipment design for York-Shipley, Inc. He is licensed as a professional engineer in both New York and Pennsylvania.

Experience of the industry accumulated over a period of 20 or more years shows that a tankless coil must be capable of delivering a minimum of 3 gpm for 5 minutes at a temperature of 140 deg. At the end of this draw period, a maximum recovery interval of 10 minutes can be tolerated if a draw of 3 gpm for another 5 minute period can then be repeated.

An examination of the heat requirements shows that to heat 15 gal of water 100 deg, we have $15 \times 8.33 \times 100 = 12{,}500$ Btu required.

Design Factors

Earlier experiments with controls designed to turn the burner on simultaneously with the demand for hot water produced many unnecessary short cycles of the burner when there were frequent short draws of hot water. An elapsed time of 30 seconds between demand for domestic hot water and the initiation of burner operation was found to be ideal. Heat available through burner operation of 4.5 minutes duration is found to be $92{,}000 \times 4.5/60 = 6900$ Btu. The deficiency in available heat is therefore $12{,}500 - 6900 = 5600$ Btu. Obviously this deficiency must be supplied from heat stored in the boiler. In a boiler having a water volume of 19 gallons, the resultant temperature drop is $5600/(19 \times 8.33) = 35.4$ deg. If average boiler standby water temperature is maintained at 200 deg, then the temperature at end of 5 minutes draw period is $200 - 35.4 = 164.6$ deg. The design of the tankless coil must then provide a capacity of 3 gpm from 40 to 140 deg with boiler water temperature of 164.6 deg. From this calculation it is found that 5600 Btu (borrowed from the boiler water) must be replaced by the burner before the draw cycle can be repeated. Since the heating capacity of boiler while burner is operating is 92,000 Btu per hr, the recovery period is $5600 \times 60/92{,}100 = 3.7$ min. From this analysis it was possible to set up a complete specification of the unit. These specifications are as follows:

1. Operating control must be capable of sensing demand for domestic hot water 30 seconds after the demand occurs.
2. Water volume of boiler must be ample to support the deficiency in boiler heating capacity. In this design 19 gallons are used.
3. The standby temperature of the water in the boiler must be maintained high enough to meet the temperature requirements of the domestic hot water system. In this design 200 deg standby is used.
4. The coil capacity must be great enough to supply 3 gpm from 40 to 140 deg at boiler water temperature obtained after 5 minutes draw. (In the final design 160 deg was actually used even though calculations show 164.6 deg would have been satisfactory.)
5. A recovery time of 10 minutes or less is required. (In the final design a 3.7 minute recovery is used). Where automatic washer needs must be met in the home, this shorter recovery period is desirable.

Actual laboratory tests under controlled conditions proved this method of analysis to be accurate and reliable. Field results obtained from over 10,000 of these installations in Levittown, Pa. have verified that it is practical.

Application to Larger Home Units

Earlier in the article a boiler having a water volume of 30 gallons and a heating capacity of 150,000 Btu per hr was cited as giving satisfactory domestic hot water performance. Using this method of analysis and standard coil ratings of 40 to 140 deg in 180 deg boiler water, it can be shown why.

Heat available from the boiler, assuming a drop in average boiler water temperature from 200 to 180 deg $= 30 \times 20 \times 8.33 = 5000$ Btu.

Heating capacity of the boiler while the burner is operating $= 150{,}000/60 = 2500$ Btu per min.

Heat required from boiler by burner operation $= 12{,}500 - 5000 = 7500$ Btu. Number of minutes burner must operate $= 7500/2500 = 3$. Elapsed time between demand for domestic hot water and burner initiation $= 5 - 3 = 2$ minutes. Recovery time $= 5000 \times 60/150{,}000 = 2$ min.

From this analysis it is quite evident that satisfactory results could be obtained in the earlier larger boilers even though controls had slower response to temperature change within the boiler. Now, by reducing the length of burner initiation time from 2 minutes to ½ minute, the same performance can be obtained with 19 gallons of boiler water instead of 30 gallons and boiler capacity of 92,000 Btu per hr instead of 150,000 Btu per hr. Obviously the lower cost of the smaller boiler unit and the increased economy of its operation through reduction in standby loss points toward major design improvements and better satisfied customers. The application of these same principles to bigger boilers indicates similar improvements and adequate domestic hot water performance in larger homes where multiple bathrooms are becoming increasingly popular.

The application of a quick recognition control system and proper selection of the tankless coil can increase the availability of domestic water 50% in boilers of 150,000 Btu per hr capacity and 30 gallons water volume. Using the same method of analysis and the same factors based on 30 second burner initiation time, together with coil ratings based on lower boiler water temperature, the following calculations can be made:

Heat required to heat 22.5 gallons of domestic hot water $= 18{,}750$ Btu. $(3 \text{ gal/min} \times 5 \text{ min} \times 150\% \times 8.33)$.
Heat available through 4.5 min burner action at 2500 Btu per min $= 11{,}250$ Btu.
Heat required from boiler storage $= 7500$ Btu.

Average boiler water temperature drop =
$7500/(30 \times 8.33) = 30$
Average boiler water temperature at end of 5 minute draw = 200 — 30 = 170 deg.
Recovery time = 7500 x 60/150,000 = 3.0 min.

From this calculation it is evident that the application of an improved control system and coil designed to deliver 4.5 gpm in 170 deg boiler water allows for a 50% greater domestic hot water supply than has been practical heretofore in larger boilers.

The desirability of a quick response control system is thus established and a practical method of accomplishing is therefore imperative.

Need for Adjustable Mixing Valve

Where a large portion of the heat provided for domestic hot water is obtained from heat stored in the boiler water, a mixing valve should be used. As the boiler water gives up heat, its temperature falls off, and a drop in domestic hot water temperature follows. When a mixing valve is applied, the initial rates of cold to hot water in the blend is fairly high, but the volume of cold water decreases as the temperature of hot water from the coil decreases, thus maintaining a more uniform domestic hot water temperature. It is strongly recommended that an adjustable type mixing valve be used, as this offers a simple adjustment for the housewife with which to regulate domestic hot water temperature to her particular needs. In the past where larger boilers with tankless coils and adjustable controls were used, it was possible to obtain fair regulation of the temperature of the initial draw of domestic hot water by adjusting the boiler controls, although downward adjustment often limited the domestic hot water output of the boiler. This required the correct resetting of at least two controls, usually the burner-operating and circulator control; otherwise the control system could be locked out. If the burner-operating control setting were lowered to reduce boiler water temperature, it could stop the burner before the circulator starts. Reducing the setting of the circulator control to rectify this condition might then be too low to properly protect the tankless coil operation. Still another variable,

Fig. 1. Rear view of tankless heating coil assembly showing cold water pocket at inlet water connection on left.

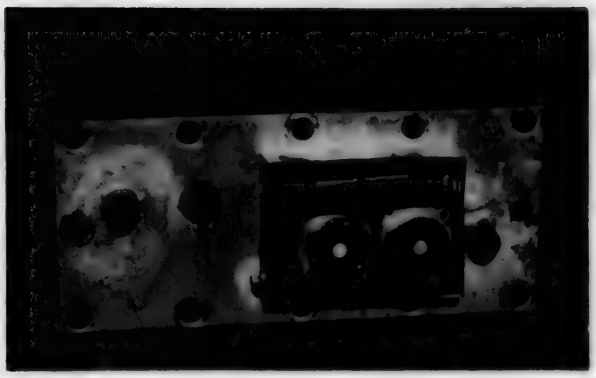


Fig. 2. Coil assembly showing controls mounted in terminal box.

the rate of flow of water through the coil, greatly affects domestic hot water temperature and the continual adjustment of boiler controls necessary to meet this variable is practically impossible.

A mixing valve automatically compensates for the flow variable as it maintains a uniform domestic hot water temperature regardless of flow rate through the coil. Thus by a simple adjustable mixing valve, the housewife may regulate domestic hot water temperature, without touching the boiler controls. The housewife's responsibility becomes as simple as the adjustment of the room thermostat to regulate room temperature in her home, while the undisturbed boiler controls always continue to maintain standby boiler temperature immediately available for house heating or hot water heating.

Type and Location of Controls

When domestic hot water is drawn from the output side of the tankless heater coil, it is replaced by a flow of cold water which enters the coil at the input connection. Since the temperature of the entering water is considerably lower than that of the boiler water, both the input connection and the coil mounting plate adjacent to it are quickly chilled.

On the other hand, when the hot water draw stops, the mounting plate area adjacent to the input connection quickly resumes its normal standby temperature.

These characteristics, and the absence of need for adjustment, make the face of the mounting plate at this point an excellent location for a fixed temperature surface mounted boiler control for:

1. On hot water draw only, a good surface mounted control placed at this location can easily start burner operation within the ideal 30-second time interval.
2. If this control has a single pole double throw switch, it can be used as a reverse acting pump thermostat to discontinue water circulation temporarily during house heating cycles and divert boiler heating input 100% to the production of domestic hot water at such times.

Use of Cold Water Pocket

The advantages of this location for a double acting fixed temperature thermostat can be enhanced if a cold water pocket is attached to the inside surface of the mounting plate behind the thermostat, as shown in Fig. 1.

The pocket helps the inflow of cold water chill the

Fig. 3. Coal assembly mounted in larger capacity boiler.

the boiler thermostat location more rapidly, but being immersed in the boiler water itself, the pocket quickly discontinues this action when the inflow stops.

There remains, then, the question of best location for a high limit thermostat and whether it should be of the immersion or surface mounting type, with adjustable or fixed temperature settings.

Application testing in the laboratory quickly established that there should be close coordination between the action of the boiler operating control and the high limit control. Adjustability in the latter proved to be more detrimental than beneficial for two major reasons.

1. The temperature spacing between the two controls should preferably remain fixed over the full range of operating conditions; it was felt that means of changing the high limit setting in the field could only invite maladjustment.
2. The use of an adjustable high limit control would require extra mounting and wiring facilities to make the adjusting knob accessible.

A study of temperatures on the surface of the mounting plate between the hot water outlet and the boiler operating control placement disclosed an ideal characteristic on which to base fixed temperature high limit control operation. In addition, it enabled a coordinated mounting and wiring relationship for the two controls, as well as a common housing for electrical and thermal insulation as shown in Fig. 2 and 3.

(Part 2, in the next issue, will illustrate and describe a number of control circuits.)

Heating Design for a Coliseum

Alabama's State Coliseum at Montgomery with its many levels of fixed seating for 8500 persons and space on the main floor for portable seats to accommodate another 6500, posed a real problem for heating engineers. The Coliseum is a new creation in architecture, unique in construction, with its barrel-arch roof curving up from the ground like the shell of a large turtle to a height of 100 ft above the arena floor.

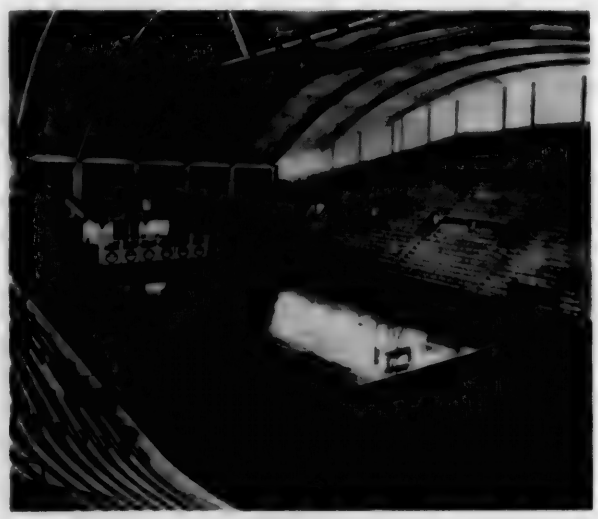
Although the seating arrangement is excellent from the standpoint of viewing an event, the Coliseum is so large that spectators in one section could be uncomfortably cold while others seated elsewhere would be too warm. To overcome this condition, special means of temperature detection and correction had to be installed.

Uniform heating in all parts of the 130 ft by 260 ft structure was attained by installation of a warm air duct system supplied by six Dravo Counterflo 1,500,000 Btu per hr, automatic, gas fired, modulating, warm air space heaters. Ducts carry warm air from the large heaters to all levels and parts of the building. A 500,000 Btu per hr unit serves the basement storage area.

To better picture the building, the roof consists of 11 segmental arches of reinforced concrete with a span of 286 feet between A-frame supports. All arches, which are of the same size and span, terminate at a continuous-type footing below ground level. This gives a flying-buttress effect beyond the building proper. The roof slab is 5½ inches thick at the arches and tapers to 3½ inches at mid-span. The outer walls outline a circle 340 ft in diameter, inside of which are concrete stands with fixed seats.

Fresh air is supplied through special entrance tunnels and recirculated air returns from the arena area through exit passageways and down stairwells. Each heater has its own blow-through fan and duct to by-pass a part of the mixed tempered air. The remainder goes through the heater and again mixes with the tempered air as it flows into the distribution duct. From the heaters, the air is distributed into the arena through outlets at the stand exits.

The Counterflo heater's stainless-steel combustion chamber, with its instantaneous heat delivery, ideally suited it for the incorporation in the complicated heating control system needed in the coliseum. This system is supervised by technicians located in two crow's nests, who constantly check temperature, humidity and ventilation values.



Alabama State Coliseum has fixed seats for 8500 persons.

Philadelphia Landmark is Air Conditioned

J. S. McCOLLAM
York Corp., Middle Atlantic District, Philadelphia.

Fig. 1. Suburban Station Building

One of the largest office buildings in Philadelphia, Pa., in use since the late twenties, is being air conditioned by a double duct system installed with little inconvenience to occupants in the building.

KNOWN to thousands of Philadelphia commuters as the final stop in the morning, and the eager departing point in the evening, the Suburban Station Building. Fig. 1, is the focal point of the new Penn Center, now under development. Located between 16th and 17th Streets and facing Pennsylvania Boulevard, this is one of the largest office buildings in that city.

Except for the commuters, it has been hidden from the eyes of Philadelphians and tourists alike, by the "Chinese Wall", part of an elevated railroad track, which has been demolished during the past two years.

This beautiful limestone and marble building faces what promises to be one of the greatest office building developments in the United States. To the southeast is a new 20-story structure known as Three Penn Center Plaza. Directly to the west, will be the New Sheraton Hotel, while to the southwest, ground has been broken for the new Transportation Building. Future plans call for Two Penn Center Plaza and One Penn Center Plaza to be built on the site of the old Broad Street Station Building, directly opposite historic City Hall.

This building, constructed during the late twenties, is 396 ft long by 108 ft wide and occupies an entire block. It rises 268 ft in the air. The sub-basement accommodates 12 busy railroad tracks, while the basement or concourse floor contains stores, restaurants, waiting rooms, ticket office and branch banks.

The ground floor has stores, and public lobbies with stairways leading down to the concourse level. From the second to the twentieth floors are office spaces, of which the six topmost are occupied by the executive offices of the Pennsylvania Railroad.

The complete building is air conditioned by a Yorkaire system. A constant volume of air is supplied to condition areas at all times. Individual office thermostats proportion the quantity of warm and cooled air to meet all outdoor weather conditions as they occur. Although the existing direct radiation heating was retained, it was put under automatic zone control in order to prevent uncomfortable drafts immediately adjacent to the windows.

Installation Caused Little Inconvenience

Because the building had no available space in the basement or sub-basement for refrigerating equipment, this equipment is installed on the twenthieth floor. Two outside air penthouses are installed on the roof of the building. One is at the east end and one at the west end, with a cooling tower between. Here, the outside air is filtered and discharged downward through shafts to the various floors. An apparatus room on each end of the building (two per floor) contains electrostatic filters, cooling and heating coils, and cold and warm air fans and controls. This arrangement permits each half of each floor to be conditioned independently of others.

Since the individual bays or modules of the building are 30 ft deep by 18 ft wide, the dual duct system is

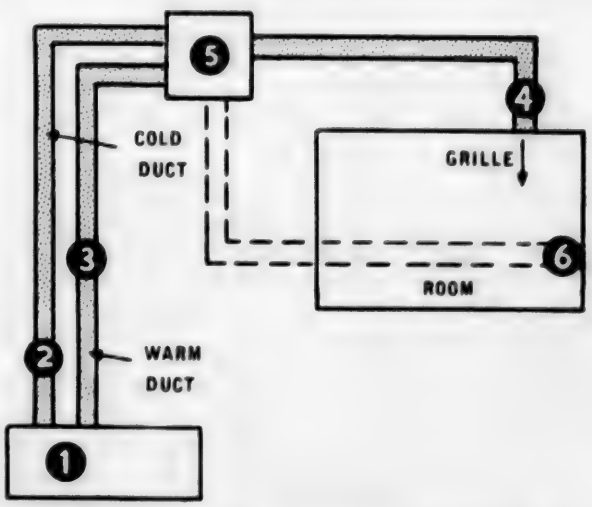


Fig. 2. Diagram which shows the operation of the double duct system that was installed.

Fig. 3. One of the two 1,000-ton water cooling systems installed on the 20th floor.

designed for both interior and exterior zones. Therefore, with the individual thermostat operating the mixing dampers, the proper combination of cooled and warm air is supplied to the offices at all times.

This system of air conditioning as installed, caused the least inconvenience to tenants since only partitions had to be cut; no floors had to be cut or reinforced for duct-work and water risers.

How the System Works

The air is conditioned in the apparatus rooms, one of which is shown as (1) in the simplified diagram of Fig. 2. In the summer time one of the main ducts (2) carries cooled, dehumidified air and the other (3) carries warm air. By means of individual thermostats (6), mixing dampers (5) are regulated to permit more or less of the cool air to be supplied to the conditioned area through ducts (4). Naturally, the same basic function occurs in winter except that the warm air duct carries warmer air, and the dampers allow more of the warm air to enter. Basically, then, in hot weather the dampers permit more cool air to be supplied while throttling down on the warm air supply. In cold weather, exactly the apposite happens.

During all seasons of the year, outside air is circulated within the building to maintain a slightly higher pressure than occurs outside. This circulated outside air is filtered twice, first when it enters the building and a second time in each of the apparatus rooms. Both the outside air and the recirculated air are electrostatically filtered before the air is either cooled and dehumidified in summer, or heated and humidified in winter. In order to maintain conditions within the building, the recirculated air is returned through the transoms to the corridors and then to the two apparatus rooms or exhaust systems. It is obvious that by using such a flexible damper-thermostat arrangement, this system permits an almost unlimited blending of cool and warm air to provide maximum comfort, under any outside temperature.

Refrigeration System

Two turbo compressors installed on the twentieth floor provide a total of 2000 tons of refrigeration. See Fig. 3. Chilled water from these two cooling systems is pumped to the 38 air conditioning apparatus rooms (two on each floor). Steam is also supplied to the air preheat coils in each of the two outside air penthouses on the roof and to the main apparatus rooms on each floor.

Sound Transmission Loss of Walls Recorded

The acoustical properties of construction materials play an important part in the design of homes, offices, and factories. For effective sound-proofing design at lowest possible cost, architects and engineers require comprehensive data in this field. One of the most critical of acoustical properties is the sound transmission loss, STL, a factor directly related to the sound attenuating qualities of a material.

Recently the National Bureau of Standards developed a rapid, accurate method for determining the STL of walls over a wide range of frequencies. The method utilizes a commercial recorder which has been adapted to present a continuous record of the difference in decibels between the sound levels in two rooms separated by a test wall. The adaptation was made by R. V. Waterhouse and R. K. Cook of the Bureau's sound laboratory.

In measuring the STL of walls, floors, and other structures, it is often desirable to obtain an accurate curve of STL versus frequency over the range of 100-4000 cycles per second. Usually STL figures are measured with a number of discrete noise bands, each centered at a particular frequency. An approximation of the STL curve of the test panel can be obtained by plotting these data and connecting the points with straight lines. Such an approximation is satisfactory for most purposes, but in studying certain aspects of the transmission of sound through panels—for example, edge or coincidence effects—a more accurate procedure is needed.

A partial solution to this problem is obtained as follows: The panel to be tested is used as a wall common to two adjacent rooms. The room containing the sound-producing equipment is called the *loud-room;* the other is called the *quiet-room.* Sound apparatus records the average sound pressure level in each test room as a continuous function of frequency, and the STL of the test panel is determined by subtracting the quiet room curve from the loud room curve. However, it is much more convenient to be able to record directly in decibels the difference between the sound levels in the two test rooms. This can be done by the Bureau's method, which presents the STL of the test panel as a chart reading.

In operation, the loud and quiet rooms are separated by the panel whose sound transmission loss is to be measured. An oscillator in the loud room supplies a warbled signal whose center frequency is motor-driven over the required frequency range.

AIR CONDITIONING HEATING AND VENTILATING'S

Reference Section

High Temperature Water

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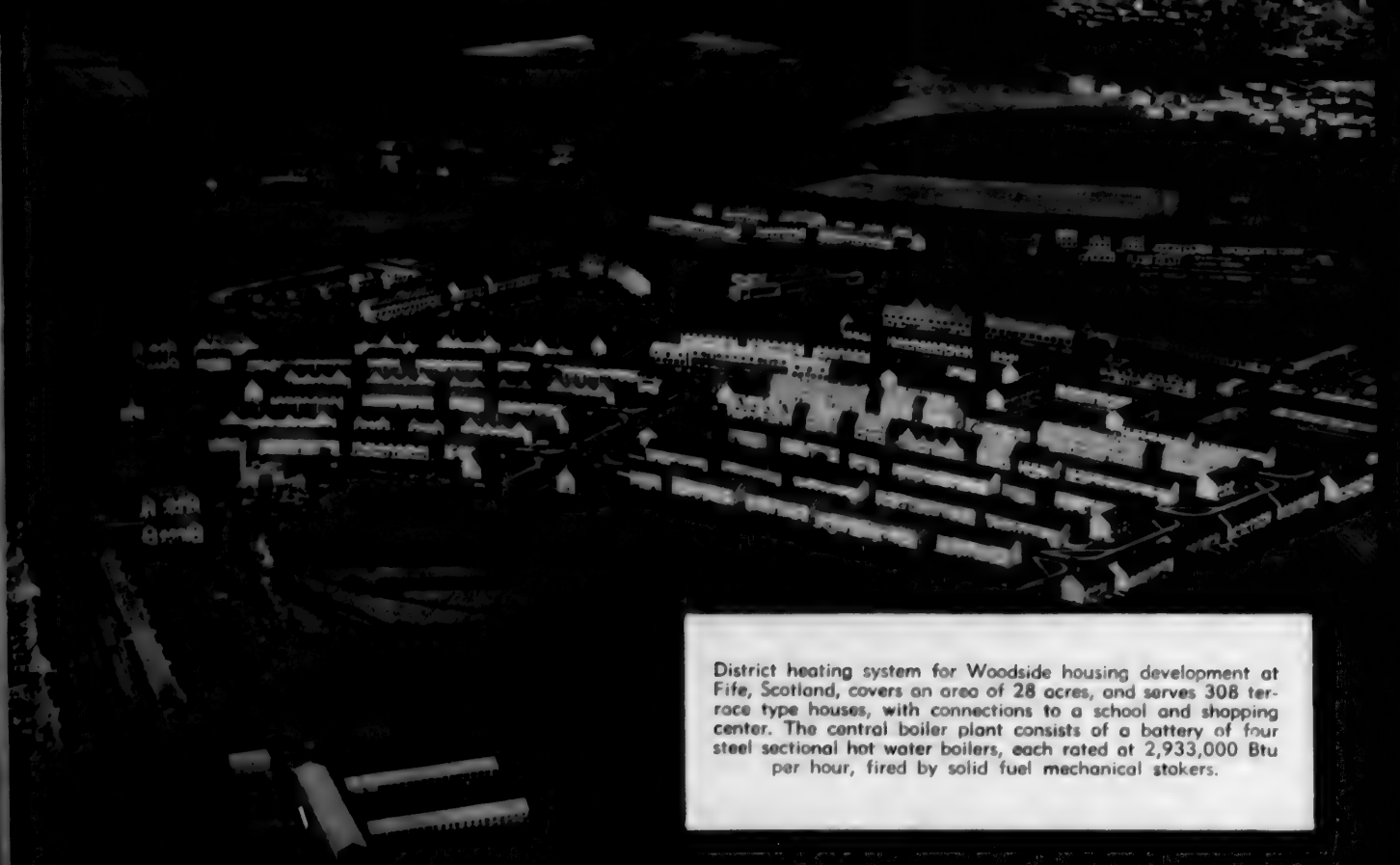
This is the first of three reference sections dealing with high temperature water, a medium of increasing importance in plant, process, and district heating. The author, an international authority, has arranged the material in five parts. Parts 1 and 2, presented in this Section, treat basic elements and central plant equipment. Subsequent parts will cover piping, local services and economics.

AIR CONDITIONING, HEATING AND VENTILATING — SEPTEMBER, 1955



District heating system for Woodside housing development at Fife, Scotland, covers an area of 28 acres, and serves 308 terrace type houses, with connections to a school and shopping center. The central boiler plant consists of a battery of four steel sectional hot water boilers, each rated at 2,933,000 Btu per hour, fired by solid fuel mechanical stokers.

High Temperature Water

OWEN S. LIEBERG

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Under modern conditions, it is essential to generate heat efficiently and to distribute it economically. Costly research to improve boiler plant and new and efficient designs for combustion units can be nullified to a great extent when the heat so efficiently produced is inefficiently distributed and used. One of the most practical developments in heat generation, distribution and utilization, is high temperature water, or high pressure hot water, generated and distributed at 55 to 350 psi and 250 to 430 deg F.

Part 1. Basic Elements

HIGH temperature water is not a recent invention but a development in thermo-dynamics over the last 100 years. It has been widely used in Europe and at last is becoming an accepted system in this country. It will provide space and process heat in factories, public institutions, housing developments, government defense areas and other establishments. It is especially economical for the transport of heat to groups of buildings spread over many square miles in area, that is, for district heating.

What is meant by the term high temperature water? A simple explanation is that, in a high temperature water system of heat distribution, the water is heated to a temperature above its normal boiling point (212 deg F at atmospheric pressure at sea level) by maintaining a pressure on the system in excess of the vapor pressure of water at the temperature required. Since the system is a closed circuit, it can be pressurized through an expansion tank usually located above the boiler. An easy operating range is to 320 deg F and 100 psig, although temperatures to 400 deg are quite common.

High temperature water is drawn from the pressurized expansion drum (Fig. 1) by the system circulating pump, and forced through the distribution system to the space

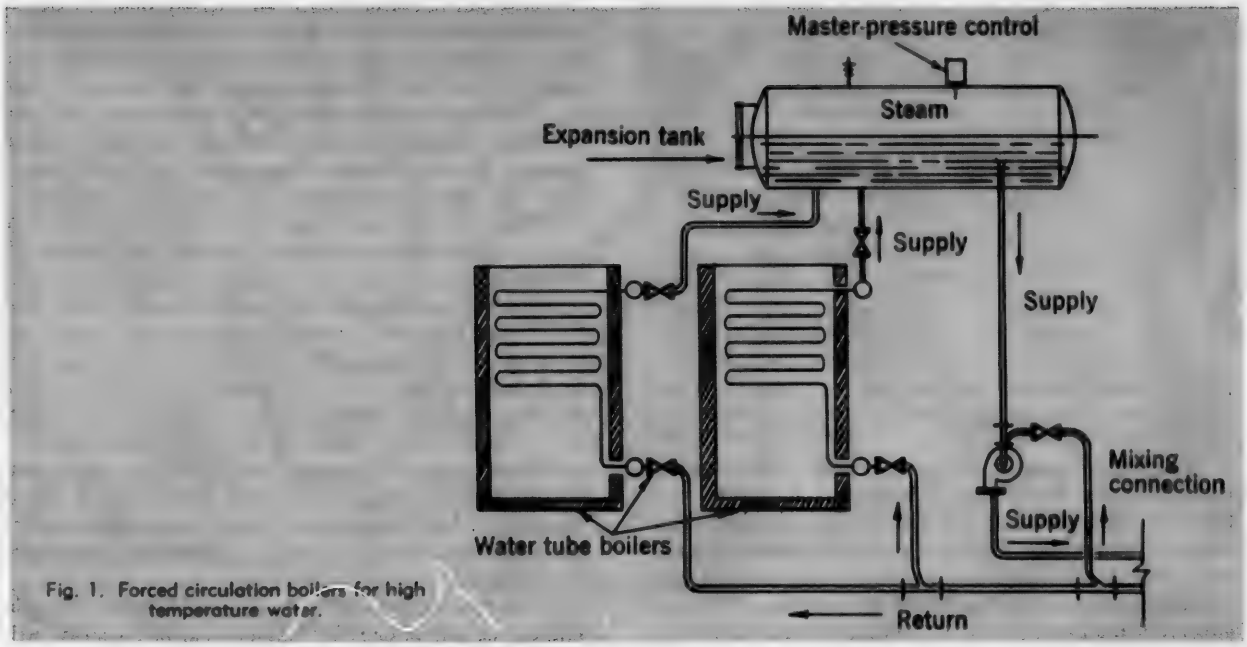

Fig. 1. Forced circulation boilers for high temperature water.

heating units, steam generators and heat exchangers which may be located in the same building, as in a factory, or in other buildings connected into the same heat distribution system. It is not uncommon for the longest external distribution pipe line in a system to be 2 or 3 miles in length, that is a closed circuit of 4 to 6 miles, with many buildings located some distances apart. Any heat remaining in the distribution water after passing through the heat consuming units and performing useful work, is returned to the boiler.

To put this briefly, high temperature water is water heated under pressure to raise its temperature to that corresponding to the pressure imposed and above the atmospheric pressure, keeping the system pressure higher than the saturation pressure corresponding to the water temperature. The high temperature water system is one which employs the more stable fluid, water, instead of steam.

The use of high temperature water in the United States has been unnecessarily restricted because engineers are not aware of its advantages. This article is written in order to present a detailed appreciation of the advantages offered and an explanation of the development of the principles involved.

The principal advantages of the system are:

(1) The system requires no steam traps and no pipe grading. Piping can be laid at any level. No pressure reducing valves are required.
(2) While the capital or first costs are no more than steam, the maintenance and operating costs are considerably less than the equivalent steam system. The savings in maintenance and operating costs, taken over many years at a large number of industrial and government plants, averages between 16% and 19% a year. This is due to lower fuel consumption and elimination of many losses.
(3) Uniform distribution of heat is independent of fluctuations in boiler pressure; regulation is simple and flexible.
(4) Reduction in size of boiler plant, when compared with steam, is balanced by the thermal storage of the entire piping system.
(5) Feed water treatment cost is negligible.
(6) Size of piping is reduced, due to the higher temperature design drop employed.
(7) There is no condensate pipeline corrosion.

But the Plant Engineer might say, "I have to use steam. My existing plant, or the equipment I am going to use is deigned for steam. How am I going to get steam efficiently and economically with a high temperature water system?"

The answer is by steam-generating heat-exchangers, which should be located as near to the steam consuming equipment as possible. With this arrangement, the high temperature water becomes the primary circuit, heating the indirect tubes and controlled by a modulating and by-pass valve, to provide steam at whatever pressure is required. Obviously any number of such heat exchangers can be connected into the high temperature water system to generate steam at different pressures, 125 to 150 psig, for process work, 10 to 12 psig for kitchens, etc.

Owen S. Lieberg received his technical education in England and has practiced as a consulting engineer in this country and in England. He is a member of the American Society of Heating and Air Conditioning Engineers; The British Institute of Heating and Ventilating Engineers; The British Institute of Mechanical Engineers; and The British Institute of Electrical Engineers. For many years he has made economy the yardstick of progressive design of heating and air conditioning systems, pioneering new and simplified methods of generating and distributing heat. He has been actively associated in the development of high temperature water systems for over 20 years. He was head of the Electrical and Mechanical Department of the British Corps of Engineers during World War II.

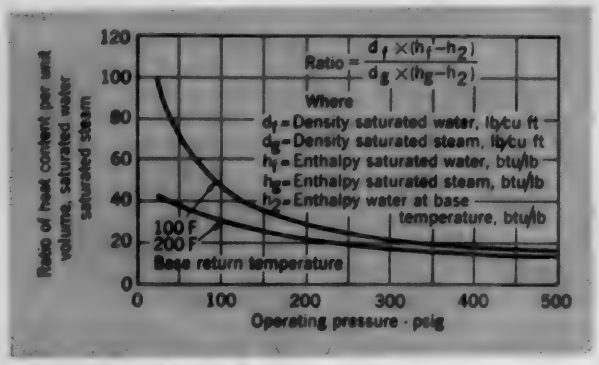

Fig. 2. Ratio of available heat per cubic foot of water to that of saturated steam at corresponding pressures above base temperatures of 100 and 200 deg F. (Combustion Engineering).

For space heating units, such as unit heaters, reheat coils for air conditioning, heating coils for ovens, etc., these are usually connected directly into the high temperature water lines. Whereas convectors, radiators and radiant heating coils are heated indirectly through heat exchangers to provide the lowest temperature. It is possible, in some instances, to connect the convectors directly in to the high temperature water lines, but this is a matter for consideration when deciding on their location.

Equivalent pressures and temperatures and other related properties of water, from 212 to 400 deg F, are given in Table 1. The total heat in Btu per cubic foot for water is impressive; and the volumeteric heat ratio, water to steam, is shown in Fig. 2. This heat ratio is of special interest as it serves to illustrate the thermal storage of the high temperature water lines, an important factor when designing the boiler plant.

Another very important factor in industrial heating, that is, process heat, is the maintenance of a uniform heat under close control of temperature. Further, with high temperature water, temperatures can be varied to meet the requirements of any particular process in heat-consuming equipment, not only irrespective of the fluctuations or demand of the process, but eliminating some of the disadvantages of steam such as uneven heating due to water film and accumulation of condensate.

When water is heated in an open vessel under atmospheric pressure (14.7 psia) boiling would normally commence at 212 deg. If this heat input is continued it will not raise the temperature of the water but will be used to convert the water into steam at the rate of 970.3 Btu for each pound of water evaporated. The total heat of saturated steam at 212 deg is 1150.37 Btu per pound, 970.3 being latent heat and 180.07 Btu being sensible heat required to heat the water from 32 to 212 deg. If, instead of being heated in an open vessel, the water is heated in a closed vessel with space above the water level for steam to collect, since the steam cannot escape, the pressure within the closed vessel will build up as heat continues, and the water will remain as a liquid until a further rise in temperature overcomes the pressure effect. It is a fundamental principle of thermo-dynamics that with each increase in pressure there will be a corresponding increaes in temperature until the boiling point is reached; in high temperature water systems the pressure of the system is always maintained above the temperature of evaporation.

To illustrate this further, water heated under 160 psia will boil at 363.53 deg F. The total heat in the steam will be 1195.13 Btu per pound, 859.2 Btu per pound being latent heat and 335.93 being sensible heat.

Suppose, for example, that the steam is piped to a heat consuming unit. The steam will be condensed and the latent heat given up in the process. For every pound of steam condensed at 160 psia, the latent heat usefully employed will be 859.2 Btu per pound, and the condensate water will have a temperature of 363.53 deg, still under the pressure of 160 psia; but the heat of the liquid will be 335.93 Btu per pound (sensible heat). When this condensate passes through a steam trap into the open condensate return line, the pressure will drop to atmospheric pressure and its temperature will drop to 212 deg. The sensible heat in the liquid will now be 180.07 Btu per pound. This release of heat will re-evaporate part of the condensate and the steam produced will be

$$\frac{335.93 - 180.07}{970.3} = 0.16$$

TABLE 1. THERMAL PROPERTIES OF WATER—212 TO 400 DEG F

Temp., Degrees F	Pressure, psia	Density, lb per cu ft	Specific Volume, cu ft/lb	Specific Heat	Total Heat	
					Btu/lb	Btu per cu ft
212	14.70	59.88	0.01671	1.0055	180.07	10,760
220	17.19	59.66	0.01677	1.0068	188.13	11,222
230	20.77	59.37	0.01684	1.0087	198.23	11,764
240	24.97	59.17	0.01693	1.0104	208.34	12,327
250	29.81	58.84	0.01700	1.0126	218.48	12,856
260	35.42	58.62	0.01708	1.0148	228.64	13,403
270	41.85	58.25	0.01717	1.0174	238.84	13,912
280	49.18	58.04	0.01726	1.0200	249.06	14,555
290	57.55	57.65	0.01736	1.0230	259.31	14,942
300	67.00	57.41	0.01750	1.0260	269.59	15,476
310	77.67	57.00	0.01760	1.0296	272.92	15,955
320	89.63	56.65	0.01770	1.0332	290.28	16,444
330	103.00	56.31	0.01780	1.0368	300.68	16,931
340	118.00	55.95	0.01790	1.0404	311.13	17,407
350	134.60	55.65	0.01800	1.0440	321.63	17,899
360	153.00	55.19	0.01810	1.0486	332.18	18,333
370	173.30	54.78	0.01820	1.0532	342.79	18,778
380	195.60	54.36	0.01830	1.0578	353.45	19,213
390	220.20	53.96	0.01840	1.0624	364.17	19,644
400	247.10	53.62	0.01850	1.0670	374.97	20,106

pounds of steam per pound of condensate at 160 psia, or 16%. Since the remaining 84% of condensate will still be at 212 deg and is too hot under standard boiler practice to use as boiler feed water, a further drop in temperature to 180 deg is essential. Thus there will be a further loss of 32 Btu per pound of condensate.

Using these figures, we can now establish the heat input to the feed water for boiler water make-up at 180 deg. Since 0.16 pounds of condensate has been lost as flash steam, this will have to be made up with feed-water at, say, 55 deg which has a heat content of 23.07 Btu per pound, the remaining 84% of condensate will have to be heated from 180, which has a heat content of 147.92 Btu per pound. The total heat input is:

$$0.16\ (335.93 - 23.07) + 0.84\ (335.93 - 147.92) + 85.92 = 1067.086 \text{ Btu per lb.}$$

Therefore, and this is an important factor for every engineer to examine when considering the difference between high temperature water and steam, 1067.086 Btu have to be supplied for every pound of steam, from which only 859.2 Btu are, in fact, used. Therefore, no matter how efficient the boiler plant may be, the heat efficiency of the system is 80.5% or a loss of 19½% under average working conditions.

While this may not occur in every steam system, there are enough accumulated data on tests made under actual operating conditions to prove that this loss is more the rule than the exception. Where leaks occur in pipe connections, where steam is flashed off at heat consuming units, or in hot wells, this loss can be and often is higher.

Since, as proved by the foregoing figures, condensate is an undesirable product of steam heating, the alternative is high temperature water heating in which all unused heat is returned to the boiler to give greater economy of operation, simpler design and easier maintenance.

It does not matter, as long as the heat is either used or recovered, whether that heat is in latent form or sensible. However, as it is more economical to use sensible heat (the latent heat can remain latent and the formation of steam be prevented), the advantage of circulating a liquid under pressure instead of a gas, which is relatively unstable, is obvious. There has always been a tendency to regard latent heat as a primary factor in heating systems, whereas it is a secondary factor. It is more important to be able to control the heat directly by controlling instruments than to rely on a change in state of the medium. Economies must follow because practically all of the heat absorbed by the water from the furnace is utilized as efficiently as possible, apart from the inevitable physical limitations associated with piping losses.

The actual distribution of heat throughout the system can be metered and controlled to extremely accurate predetermined limits. It will be proved that the pipe line distribution losses represent an extremely small proportion of the total heat in circulation. Of course, in addition to these losses, there will be the possible leakages through such fittings as valve stems and pump glands, but the advances which have been made in recent years in the design of such equipment have reduced this loss to a minor factor.

In the standard high temperature water system, the water line insofar as the boiler is concerned, is maintained either in the boiler itself, as with the Scotch or Marine type boiler (Fig. 3) or in the drum of a water tube boiler, much the same as in a steam system, but with the difference that the steam space above the water line is employed not only to furnish the super-atmospheric pressures to which the water may be taken, but also to accommodate the expansion and contraction of the water in the distribution system generally.

With water tube boilers and adaptations of shell type boilers, it is preferable to take up this expansion and contraction, however, in a separate expansion drum placed just above the boiler. The designed working pressure, which will be indicated by the pressure controls, determines the maximum temperature of the water which will, of course, contain the sensible heat in the water at the corresponding steam pressure as given in the standard steam tables. Thus, contrary to the usual practice of leading from the steam space, the water in the high temperature water system is drawn from a point below the water line and mechanically circulated through the distribution system. The water in circulation is, of course, under super-atmospheric pressure in all sections of the system

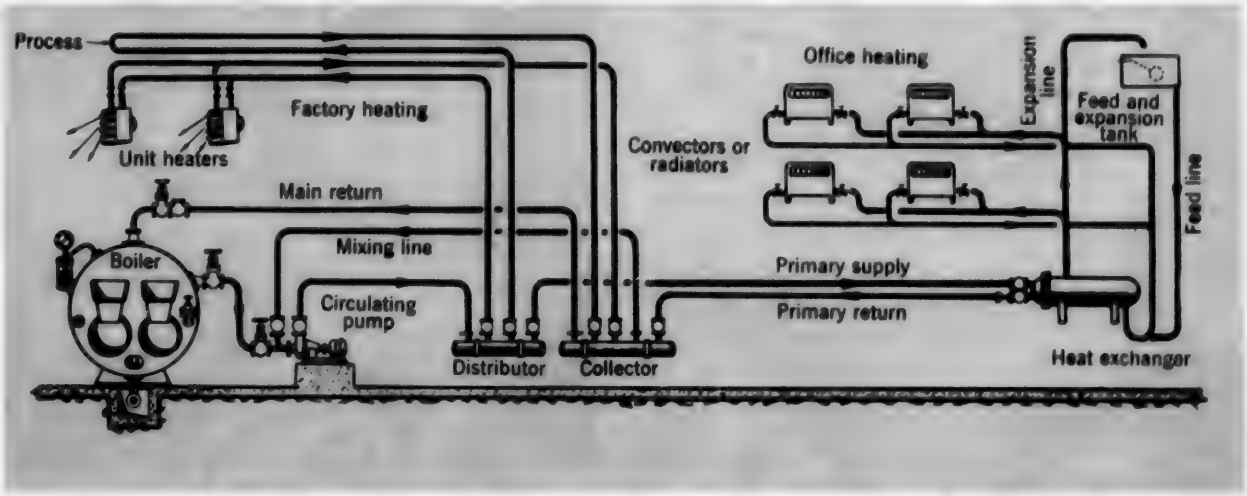

Fig. 3. Industrial heating connected with office heating as suggested by Arthur Heaton & Co., Ltd., of England.

Fig. 4. One of four huge boilers used in high temperature water system at McGuire Air Force Base at Wrightstown, N. J.

and it will remain a liquid as long as this pressure is maintained.

Major developments in the technique of high temperature water systems have resulted in boilers, pumps, valves, unit heaters, radiant heat panels, heat exchanger and control equipment being developed and constructed especially for this work. It should be clear that high temperature water equipment can be designed to operate to a series of accurately calculated pre-determined conditions which do not present any considerable technical difficulties. Fundamentally, therefore, the system is an extension or development of the simple principles involved in the familiar accelerated hot water heating apparatus.

High temperature water can be used for direct heating through heater batteries, autoclaves, presses, particularly in the rubber and plastic industries, in tank coils in the plating and textile trades, in heating ovens and so on.

The engineer, when considering the transfer of heat from one surface to another or from one medium to another, is concerned only with the temperature difference between the two. It is immaterial how that heat is provided, whether it is latent heat or sensible heat; but what is important, is the overall efficiency and heat reserve of the system. In one large system recently put into operation there is a 24 hour reserve of heat in the external pipe lines.

Comparisons are always interesting and the following heat carrying capacities of steam and high temperature water lines serve to show the advantages of the latter medium. As shown in standard tables, a cubic foot of water at 175 psia, and 371 deg has a density of 54.8 lb per cu ft and a heat content of 18,830 Btu per lb. A cubic foot of saturated steam at the same pressure and temperature has a density of 0.385 lb per cu ft, but its heat content is only 461 Btu. There is, in other words, over 40 times more heat in a cubic foot of water at 371 deg than in a cubic foot of steam. There are even more marked differences at the lower temperatures.

At a pressure of 125 psia or 344 deg, the heat content of a cubic foot of high temperature water is 17,600 Btu, whereas with saturated steam the heat content per cubic foot is 332 Btu, or 53 times more heat with water.

On the other hand, the engineer is also concerned with the heat given up by the heat medium or its heat transfer characteristics. From the foregoing figures, one cubic foot of saturated steam at 175 psia and 371 deg, if condensed, would give up $852.8 \times 0.3005 = 256$ Btu per cu ft. One cubic foot of high temperature water at 371 deg with its heat content of 18,830 Btu, if cooled through 100 degrees, the minimum temperature drop, to 271 deg, when its heat content will be 14,002 Btu, will give up 4,828 Btu per cubic foot. Therefore, the water will give up, under equivalent design conditions, almost 19 times the heat that steam will give up when condensing.

It is apparent that the following are the guiding factors for the designing engineer:

(1) Water pressure
(2) Density
(3) Specific heat
(4) Boiling point
(5) Sensible heat

Since all high water temperature water systems must operate under pressure, the type of pressurizing must next be selected. A high pressure hot water system is usually assumed to be one in which the pressure is over 55 pounds per square inch gage, or approximately 300 deg F. Below that temperature or pressure it is either a medium or low pressure system.

There are several methods of maintaining the pressure head; the simplest form being the use of an elevated tank. But this, however, necessitates height, often im-

Fig. 4a. Two 15,000-gallon expansion drums at McGuire base store reserve hot water and maintain 300 psi operating pressure.

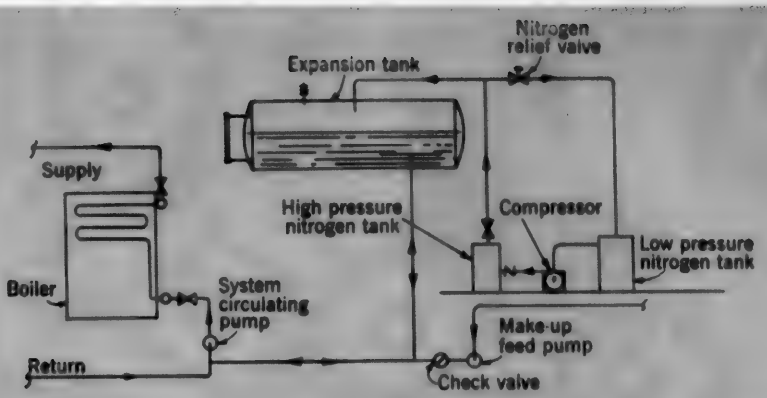

Fig. 5. System pressurized with nitrogen.

practicable, and introduces the hazard of boiling in the tank and upper pipe lines.

The most common and economical method is that of using steam in the expansion tank or steam drum. This is shown in Fig. 1, the high temperature water being taken from below the water line. Since there is a definite relationship between the pressure of the system and the temperature of the water, the steam pressure in the expansion tank is the controlling factor for the operation of this system. Boiler and expansion tanks used in an outstanding U. S. installation are shown in Fig. 4 and 4a.

An alternative method of maintaining pressure is by air or an inert gas such as nitrogen. As air is corrosive, especially at these higher temperatures and quickly absorbed by the high temperature water, its use is not recommended. But nitrogen, having no corrosive characteristics, is well suited for this work. There are several ways of using nitrogen, and the following is the simplest.

The pipe lines and boiler are filled with water, but since the system is a closed one, the expansion and contraction of the water is taken up in a separate tank, as shown in Fig. 5. The nitrogen is kept under pressure and pumped by a compressor into the expansion tank and controlled to a predetermined head. The expansion tank or pressure vessel must be constructed for full boiler pressure, and its size determined by the water content of the whole system. The size of the tank can be kept to a minimum if the corresponding volume of water of expansion is taken within the range of the operating temperatures. The upper and lower levels of the water can be determined and set by the controlling instruments. The space above the water is charged with nitrogen at a pressure varying from 350 to 400 psi according to the requirements of the system. This cushion of nitrogen taking no heat and excluding oxygen, is superior in some ways to steam or air compression.

Heat-Power Stations

Distribution of heat and electricity from a single central power and heat station is another development which has proved both practical and satisfactory in Europe. It greatly increases the efficiency of the generating station and lowers the cost of electricity and heat units. Heat can be distributed by medium temperature or high temperature water systems or a combination of both in an arrangement such as is shown schematically in Fig. 6. While heat-electric generation greatly improves the economic aspects of district heating, the main technical advantages are as follows:

(1) Increase of the adiabatic heat drop.
(2) Use of large hot water storage accumulators.
(3) Optional use of a double heat storage system.

(1) When the initial steam pressure is increased and the back presure decreased, the heat-electric station becomes more efficient since the adiabatic heat drop is increased and the steam consumption per kwh reduced. In this way, the boiler plant size can be reduced proportionately and the thermal-electric station operated more efficiently.

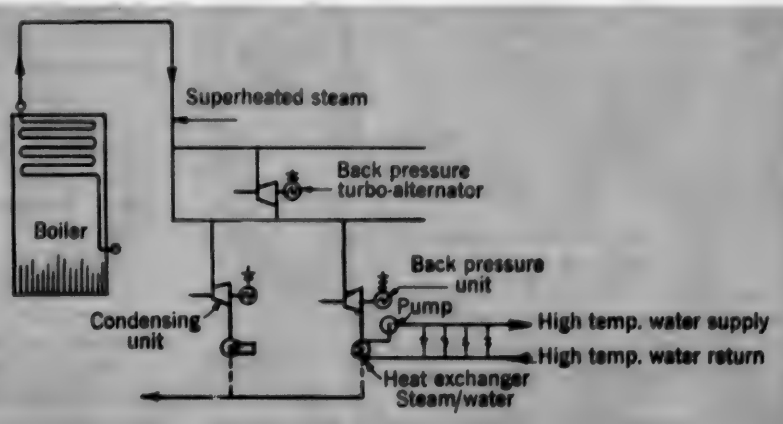

Fig. 6. Back pressure and low pressure condensing sets in series: When not required for district heating, the back pressure steam is supplied to the low pressure condensing unit. The load factor of the back pressure units is considerably improved.

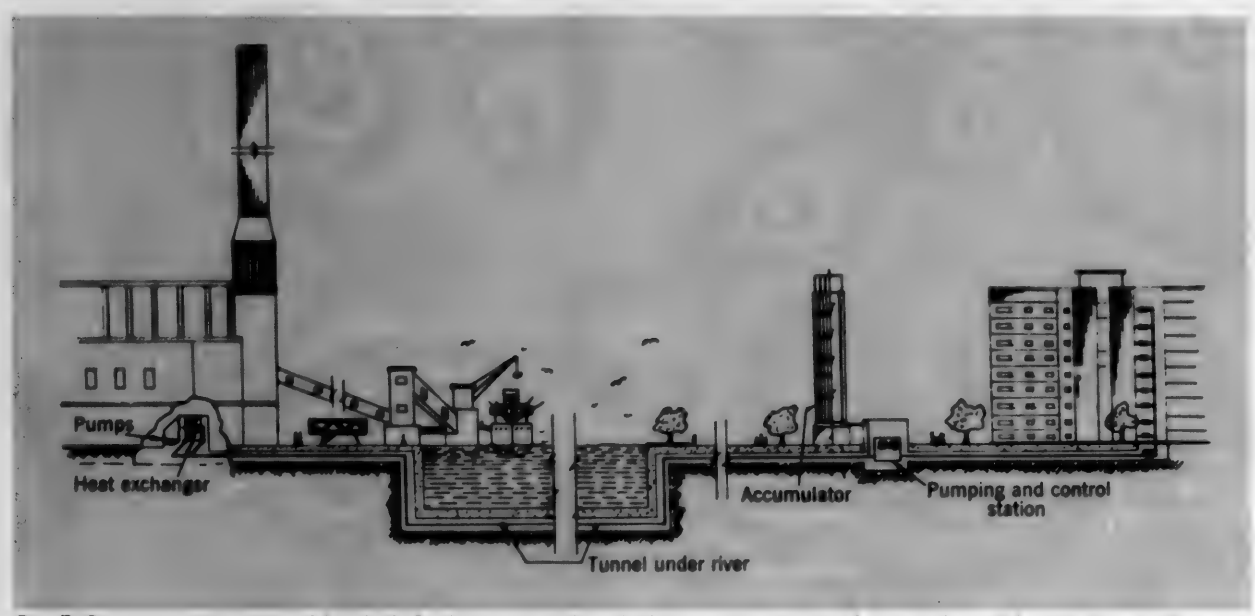

Fig. 7. Diagrammatic section of London's Pimlico system where high temperature water from condensing heat exchanger in power station is pumped under the Thames to an apartment housing development.

The decrease of back pressure is significant. At a back pressure of 20 psia, the power generation factor is 83 kwh. At 40 psia, the power generation factor is reduced to 72 kwh. But the equivalent temperature of steam of 20 psia, is 228 deg whereas the temperature of steam at 40 psia is 267 deg. The higher temperature being more desirable for heat storage and distribution, the difference will offset the increase in the power generation factor. With a back pressure of 50 psia and an equivalent temperature of 281 deg, the power generation factor is 68 kwh, which is not such a sacrifice when the greater heat available for distribution is considered.

In industrial plants where steam is produced for turbines or steam engines for electric generation, the back pressure steam can be passed through the primary circuit of a heat exchanger and the heat utilized for heating a medium pressure hot water system. If the distribution lines are not too extensive, temperatures between 250 and 260 deg can be used for space heating in district heating systems for housing and similar developments where these lower back pressures can be adopted.

The most efficient system of converting heat in the thermal electric station is to vary the exhaust pressure of the turbines and to extract steam at a higher pressure in order to raise the temperature of the water at night when the electrical output is at a minimum, and store this heated water for use in the day time when the electrical output is at its maximum and when the back pressure must be reduced to the best operating conditions.

(2) The use of an accumulator for thermal storage enables the heating and electric loads to be balanced or at least so closely related as to reduce greatly the overall cost of heat generation and electrical output, so that the annual load factor of the thermal electric station is equal to that of a condensing station.

(3) Not only is the heat from the steam used after passing through the turbines but, at off-peak hours, some of the electric power load can be used for heating water at distant points by electric immersion heaters. Thus there are two examples of thermal storage; (a) direct heating from the turbine steam for comparatively local distribution and (b) electric thermal storage at lower temperatures for distant heat distribution.

One system of high temperature water which has proved satisfactory in Germany was introduced there to increase the efficiency of an electric generating station by taking the steam from the turbines and passing it into a direct heat exchanger or cascade converter. This steam mixes with the return water from the high temperature water system, thereby conserving the heat which would otherwise be lost. Generally, the water from the cascade heater passes to the boiler and is boosted to the operating temperature under pressure-flow control. In mild weather, during spring and autumn months, the addition of boiler heat is restricted to minimum requirements, or not taken at all.

An alternative and somewhat similar system to this is the use of a heat exchanger whereby the steam is extracted from the low pressure end of a turbine, or bled from the turbine and passed into a heat exchanger which heats the return water from the district heating system indirectly through the converter coils.

In London, England, one such system comprises a heat exchanger in the electric generating station which heats the water being circulated, and pumps it under the Thames River to a housing development on the other side of the river. There, as shown in Fig. 7, the heated water is stored in a thermal accumulator which has a capacity of 400 million Btu. This water is then circulated to the blocks of rental apartments as required.

These European systems have proved over the many years during which they have functioned successfully, that heat, instead of being wasted, as it is today in hundreds of industrial factories and buildings, can be utilized efficiently with existing staffs, and considerable economies effected, both in operation and maintenance.

Part 2

Central Heating Plant Equipment

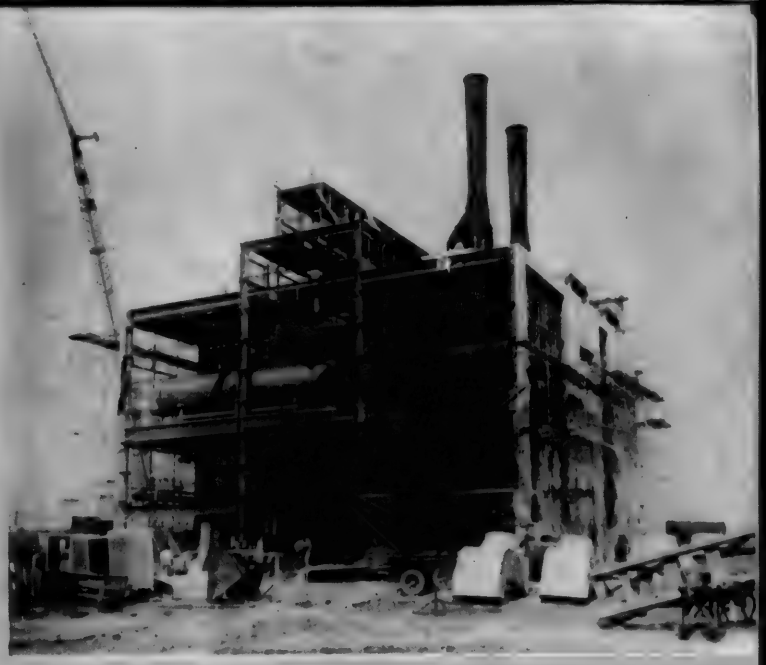

Fig. 8. Central plant at McGuire Air Force Base under construction showing expansion and storage tanks in place.

The selection of the most efficient and practical equipment for high temperature water is a problem which every designing engineer has to consider next. His experience and the experience of others who have planned or used high temperature water is his only guide. But first of all it should be remembered that plant engineers have to live with operating and maintenance costs. Once the system is finished and handed over to the plant engineer, items of major importance are (a) the electricity costs of the pump motors, (b) the boiler fuel costs, and (c) the replacement costs of other pieces of equipment. Therefore, the selection of the boilers and other equipment shown being installed in Fig. 8 and in the diagrams, Fig. 9 and 9a, is of the greatest importance. It not only affects the overall efficiency of the system and particularly the size of the system circulating pumps, but also operating costs.

Since the main advantage of high temperature water is its use as a distributing heat medium over long distances, friction heads or pressure drops must be carefully watched when designing the system, or selecting the boilers and other equipment.

Boilers

A relatively high pressure drop is a characteristic of steam raising boilers and any such boiler which has been adapted or modified for high temperature water, should be used only where external distribution lines are short. Where long pipe runs are necessary, only water tube boilers especially designed for high temperature water and having a low pressure drop, should be installed and every effort made to keep the total friction loss to an absolute minimum.

The use of a boiler with a high pressure drop can easily add 10 hp or more to the system circulating pump motors. A boiler requiring a boiler circulating pump can do the same. Since this additional horsepower is taken 24 hours a day and is multiplied by every boiler put on the line, only boilers with a low pressure drop should be used. While, generally speaking, most boilers capable of operating at pressures up to 250 psig can be used for high temperature water heating, the water tube boiler has many advantages which the fire tube boiler cannot offer. Economically speaking, a total heat load of 5 million Btu per hr is about the minimum for which high temperature water is recommended.

In the lower ranges, 5,000,000 Btu per hr to 10,000,000 Btu per hr, the fire tube boiler, Scotch Marine horizontal return, can be used, although its efficiency is much lower than the water tube boiler. High temperature water systems with a heat load above 10,000,000 Btu per hr should, without question, be designed with water tube boilers, such as the controlled circulation boiler shown in Fig. 10.

The shell type or Scotch boiler with its larger water content can be used without an expansion drum if the system is carefully designed. Not only is this type of boiler limited to 7 to 8,000,000 Btu per hr, but after a few months working under normal conditions, its highest overall efficiency is seldom above 75%, whereas the water tube boiler is considered inefficient below 80%. It is the relatively low heating surface of the fire tube boiler, of which there are many on the market, which limits this type of boiler to relatively small high temperature water systems.

It is therefore recommended that the water tube hot water boiler or forced hot water controlled circulation unit be used for all high temperature water systems above 5,000,000 Btu per hr. The return water from the system enters the bottom distributor header of the high temperature water tube boiler from which it passes through the tube elements arranged in parallel as shown in Fig. 11. These tube elements completely cover the walls of the combustion chamber to form water walls. Depending on the design of the boiler, the water flows first through these water wall tubes and then into the upper convection tubes, or it may be reversed, the convection tubes acting as economizer tubes, with the water flowing first through the convection tubes and then into the furnace wall tubes. In this type of boiler, the radiant tubes in the combustion chamber may touch one another or be fitted with fins which, with the refractory lining will virtually cover the

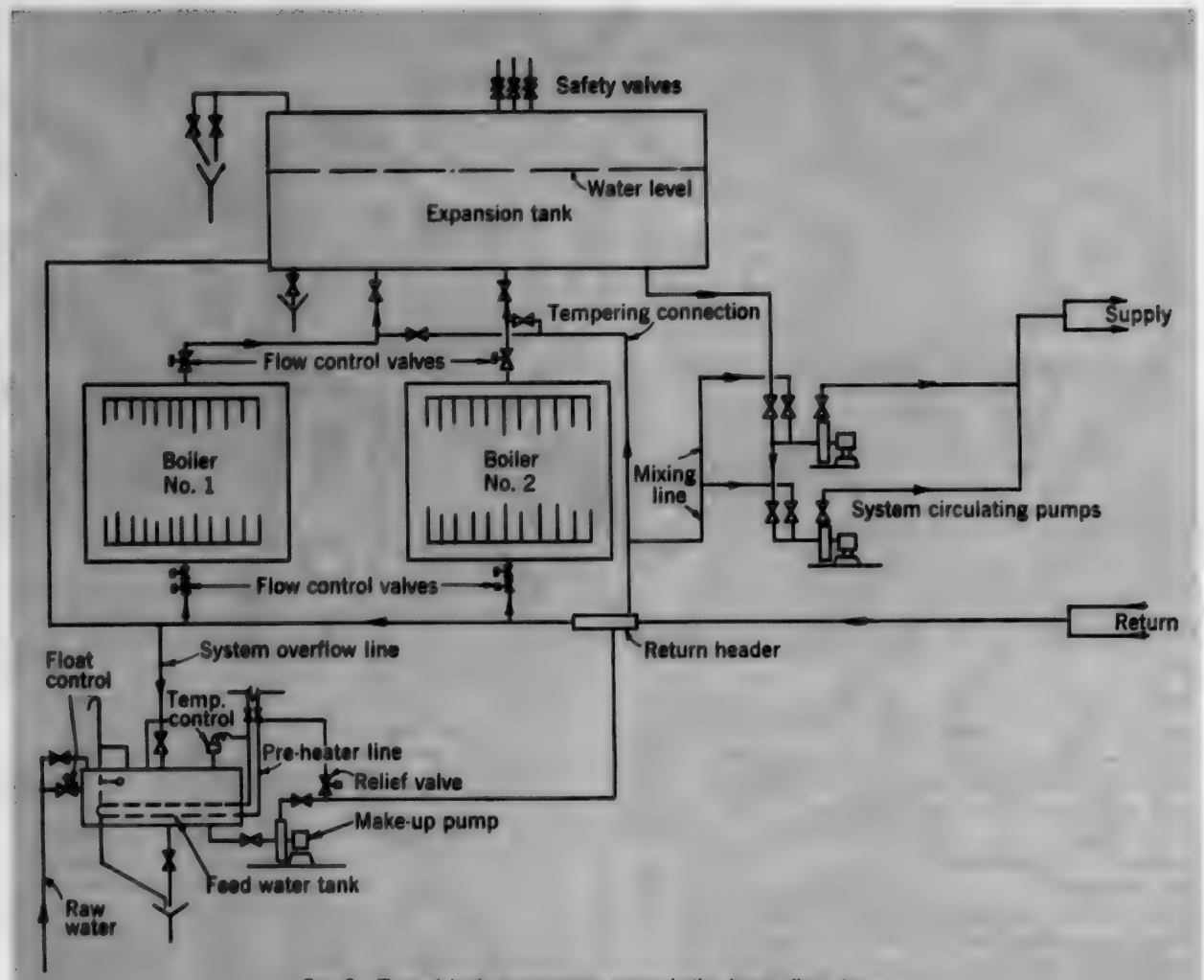

Fig. 9. Typical high temperature water boiler house flow diagram.

entire walls of the combustion chamber. A compact tube arrangement is shown in Fig. 12.

It will be clearly seen that, due to its very high heat transfer, by radiation and convection, it is possible to design the water tube boiler with more heating surface per unit volume and thereby reduce the overall dimensions of the boiler. Its compact design, high heat transfer, and low pressure drop make it most advantageous for high temperature water.

Water tube boilers of the drumless type require an independent steam-water drum which is usually placed above the boilers to provide one single balancing vessel for the whole system. This elimination of separate steam and water drums on each individual boiler, obviates the need for "balancing-piping" for equalization of pressure and flow, when two or more more boilers are installed.

The following factors are given as a guide and should be taken into account when selecting the type, size and pressure of the high temperature water boiler unit:

(1) Total heat load of the system in Btu per hour;
(2) Peak load and maximum period of heating;
(3) Highest pressure of any steam consuming unit on the line;
(4) Highest temperature of any hot water heating unit on the line.

To follow this through, taking advantage of the thermal storage in the piping system, boilers for a high temperature water system should be selected in the following way:

Example: A project has a connected heat load of 24,000,000 Btu per hr, of which the steam load is 10,000 pounds of steam an hour at pressures varying from 40 psig to 125 psig, and the space heating load is 14,000,000 Btu per hr, consisting of such space heating units as convectors, unit heaters and air conditioning coils working at a maximum temperature of 300 deg F.

The peak load is in the winter when there will be both space and process heat requirements from 7 a.m. to 5 p.m., the noon shut down not being taken into account. A diversity factor can be assumed for steam-using equipment, or a total of 7,500 pounds of steam an hour, but the full connected load must be taken for space heating when outside temperatures are at, or below freezing and all heating units will be working at maximum output.

Since the peak load of 21,500,000 Btu per hr will have to be maintained for 10 hours in the coldest weather, the thermal storage in the entire pipe line becomes an accumulator from which the system will be drawing heat

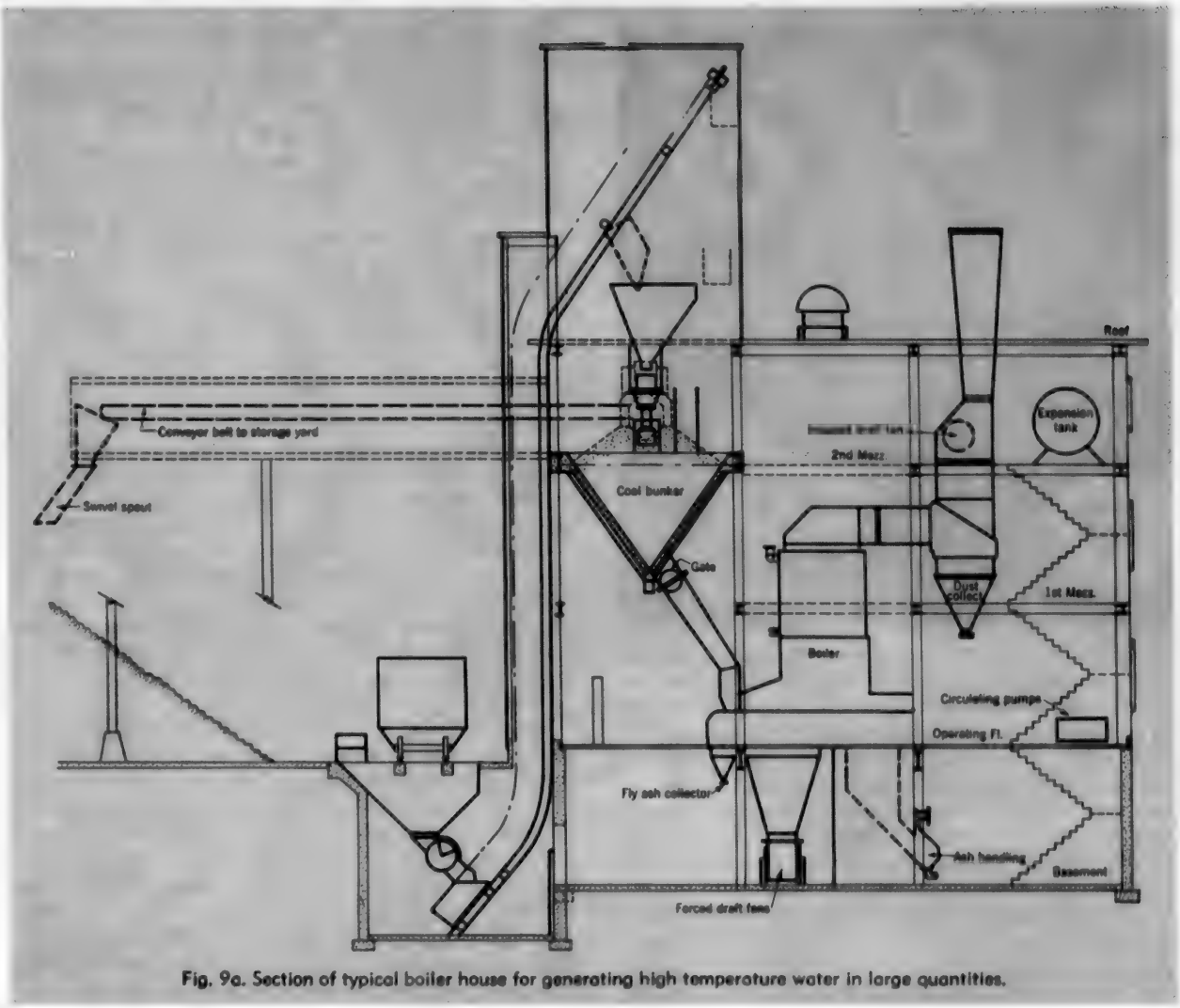

Fig. 9a. Section of typical boiler house for generating high temperature water in large quantities.

and not from the boilers directly. This thermal storage can be conservatively estimated to be equal to at least 12 hours of the total load or approximately 250,000,000 Btu. Boilers, therefore, in a high temperature water system are operated to maintain a thermal accumulator, and since one, at least, will be operating for 24 hours, the heat make-up requirements are considerably less than the full load, which in this case is 21,500,000 Btu per hr. In practice it has been found that 80% of the total heat load will provide adequate boiler plant for the high temperature water system.

80% of 21,500,000 = 17,200,000 Btu per hr.

To ensure flexibility and the use of a standby unit for overhaul, inspection or repairs, it would be standard practice to install, in this project, 2 boilers each 2/3rds of the above load, or 11,500,000 Btu per hr each.

If, on the other hand, this project had been designed for high pressure steam, the boilers would have to meet the full continuous rating of 21,500 pounds of steam an hour, which means that, taking the conventional standard of 2 boilers 2/3rds of the full load would be:

$2 \times 21{,}500/3 = 14{,}500$ lb per hr

or 14,500,000 Btu per hr approximately, each; *an increase of* 26%.

To decide the operating pressure at the boiler or at the expansion drum, the designing engineer must next take the maximum operating pressure of the various steam consuming units. As the steam consuming equipment is at a higher pressure than any of the space heating units on this project and since the maximum pressure at the farthest steam unit is to be 125 psig, and allowing for radiation line losses and heat exchanger losses, the temperature of the hot water leaving the expansion drum must be at least 25 deg higher than the equivalent temperature of steam at 125 psig, or 353 + 25 = 378 deg. The equivalent pressure to 378 deg. is 176 psig. A pressure of at least 176 psig will therefore have to be maintained at the outlet of the expansion drum. This temperature of 378 deg will be more than sufficient for the farthest space heating unit, since only 300 deg is required.

All equipment for the central heating plant should be designed for the relatively high temperature of the water, and the boiler pressure, and the head pressure of the system. This is especially necessary in the selection of valves, fittings and controls. All isolating valves should have stainless steel trim and cast steel bodies. Reports

Fig. 10. Water tube boilers installed by Charles Simkin & Sons, Inc. at McGuire Air Force Base are rated at 10,000,000 Btu per hr each.

from plant engineers vary as to whether gate or globe valves should be used in the boiler house for isolating lines. The general preference is for gate valves to reduce the friction head and ensure complete shut-off. Gate valves may be either of the parallel slide or wedge type. In practice, the wedge type appears to give better results over long periods. High temperature water, due to the high pressures, is more penetrating and, due to capillary action, causes minute leakage. This leakage flashes instantly to steam, and although not seen, leaves after some months, a fine scale deposit from the salts in solution left behind from the evaporation. This minute deposit must be removed from time to time to prevent the spindle from binding. This applies to both manual and automatic types of valves.

Expansion Tank

Since it is impossible to take up the expansion of the heated water within the boiler, even in a "Scotch" shell type boiler or its equivalent, an independent expansion tank is necessary. Further, as this tank also serves as a pressure vessel to maintain the operating pressure on the system, it must be large enough for both duties. By absorbing the expansion and contraction, the original water is retained and only a minimum quantity of feed water make-up with a consequent reduction in chemical treatment will be required. Even in a large system, this is no more than a few gallons a day.

The initial expansion of the raw water from 50 deg to the mean temperature of the heated water at say, 300 deg can be drawn off the system through the blow-down valve until the excess water is eliminated. When the water level in the drum is at the midpoint as seen in the water gage and at the temperature required, the blow down valve is then closed and further expansion to the maximum temperature is contained within the expansion tank. Raising the temperature of the water from 50 to 350 deg will increase the volume by over 11%. On a large diameter tank, the gage glass should be large enough to take up a surface rise and fall of 24 inches.

The expansion tank needs the following fittings:—safety valves according to the code requirements, relief valve, and high and low water level alarm fittings and connections. The controls which will be required are additional and discussed separately.

To calculate the size of the tank, the following example should be followed. (Reference should be made to Table 1 "Thermal Properties of Water.")

Assuming the capacity of the system to be 500,000 lb of water, and the supply temperature to be 350 deg with a return temperature of 250 deg (that is a design temperature drop of 100 degrees) and the make-up boiler feed water temperature at 50 deg, then total volume of 500,000 lb water at various temperatures will be:

Temp., Deg F	*Sp. Vol., Cu Ft per Lb*	*Total Vol., Cu Ft*
50	0.01603	8,015
250	0.017	8,500
300	0.0175	8,750
350	0.018	9,000

For an expansion from 300 deg to 350 deg maximum temperature, there will be 9,000 − 8750 = 250 cu ft increase. Allowing 24 inches rise and fall, the expansion drum should be large enough to give a surface area at the water line of 125 sq ft. Therefore, the expansion tank should be 8 feet diameter and 16 feet long to allow for the curvature of the cylindrical tank. If the expansion is calculated from 50 to 350 deg, the increase in volume would be 985 cu ft or almost 4 times that from 300 to 350 deg.

The expansion tank should be placed well above the boilers to allow for expansion loops in the pipe lines between the boiler header and tank. But while the expansion tank does not have to be directly above the boilers, it is better, again for piping design, to locate it directly above the system circulating pumps.

Care must be taken when designing the inlet and outlet connections to the expansion tank. The supply outlet leading from the tank to the system circulating pumps should be so placed that no vortex can be formed

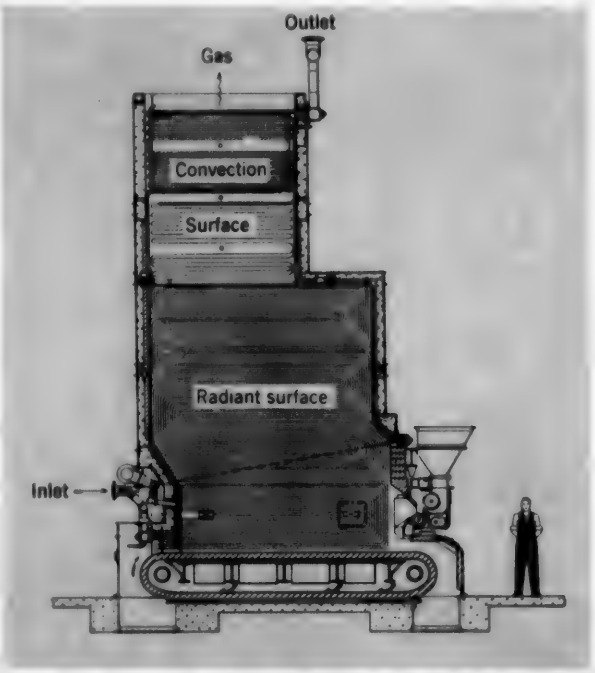

Fig. 11. Section of C-E LaMont controlled circulation boiler.

where the velocity is highest and through which steam can be drawn with the water. If, as may be the case in a small high temperature water system using a shell or Scotch type boiler converted for generating high temperature water, a dip pipe is used, the entrance to this pipe must be well below the surface where small steam bubbles collecting near the surface cannot be drawn into the supply line to cause water hammer and troubles at the pump.

Where two expansion tanks are connected together they must be fitted with steam and water balance pipes to keep the two units in equilibrium. These steam and water pipes must be used solely for this purpose and not connected into any other lines.

Cascade Heat Exchangers

Fig. 13 illustrates the alternate type of expansion tank in which live steam is mixed with the return water from the system in order to generate high temperature water. This direct heat exchanger is fitted with a series of plates to cascade the incoming water and, by mixing with the steam, offers a larger surface for immediate and efficient heat absorption. Steam enters at the top of the cascade heater. The return water from the high temperature water system comes in also near the top of the cascade heater on two sides for preference, thereby coming into direct contact with the steam to absorb both latent and sensible heat and mixing with the resultant condensate. The water level is maintained automatically so that surplus water is continuously fed back to the boiler through the hot water feed tank.

The return water can be pumped into the cascade heater by the heater circulating pump, not to be confused with the system circulating pump. This pump, by forcing the water against the cascade plates, creates a fine spray with which the steam mixes. With the cascade tank at roof level and the heater circulating pump on the boiler house floor, the high head thus gained will prevent flashing or cavitation at the pump.

The cascade heater was originally designed to raise the efficiency of the electric generating station by taking steam from the turbines and utilizing the heat for high

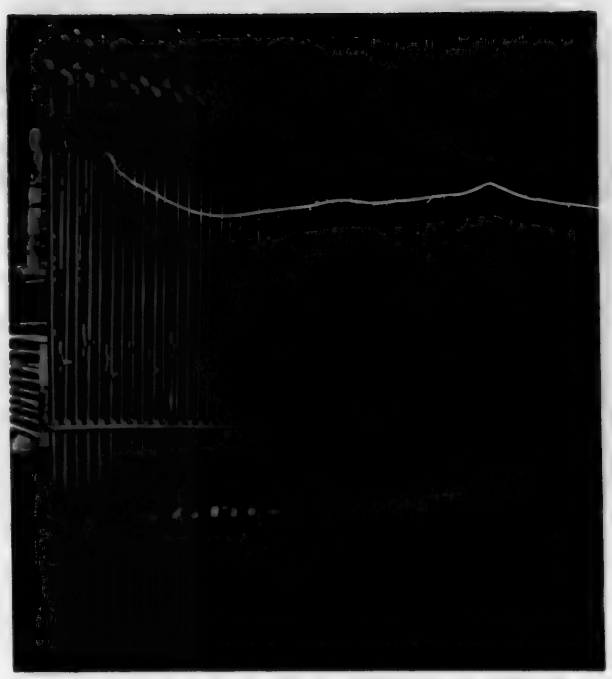

Fig. 12. Water tube arrangement in C-E boiler during construction at McGuire Air Force Base.

temperature water generation and distribution. In many European cities such systems have been in successful operation for almost 20 years. That it could be successful in this country is obvious.

In smaller systems where electricity is not generated but where steam is being produced for process work, the cascade heater does not have to be located in the boiler house, but can be at any point in the factory where steam is being used and where it would otherwise become wasted. This is the reverse of the high temperature water system generating hot water in the boiler house and circulating the heated water to an indirect heat exchanger at some distant point in the factory to generate steam. The cascade heater is efficient and serves a useful purpose in the steam-electric station, but is not to be recommended

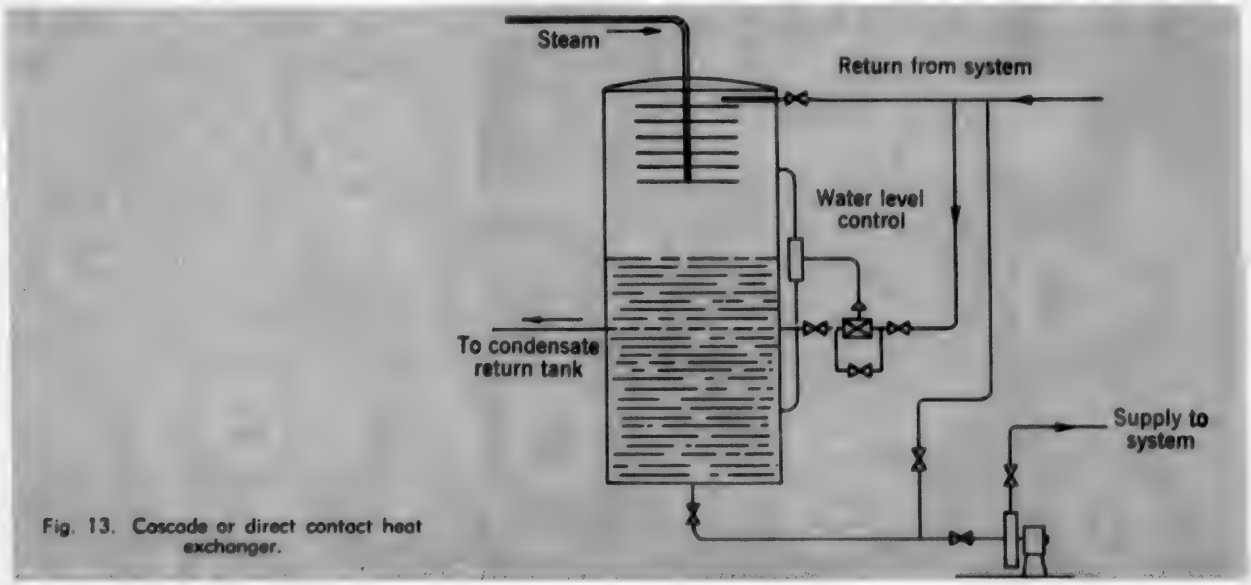

Fig. 13. Cascade or direct contact heat exchanger.

Fig. 14. Zone circulating pumps at McGuire Base. Each delivers 125 hp push to high temperature water in 11-mile distribution system. Hand wheels control mixing valves in basement.

for use in factories, except where an existing plant has surplus steam available for conversion.

Pumps

The design and choice of the system circulating pump is of vital importance to the successful operation of the high temperature water system. It is the heart of the system and, without it, heat distribution ceases. The pump must therefore not only be designed to handle the water at the high temperature involved but the design head against which the pump will operate must be carefully calculated. The quantity of water to be handled must be defined within the limits estimated. In other words, if a pump is designed to deliver 700 gpm when pumping against 200 feet head, it will deliver a greater gallonage per minute when pumping against 160 feet head and will absorb a higher power input. It is important then for the pump manufacturer or the designing engineer to determine the point of maximum efficiency and allow for a "non-overload" characteristic, so that if the head drops and the gallonage increases, the B.H.P. absorbed will be within the horsepower of the driving motor selected.

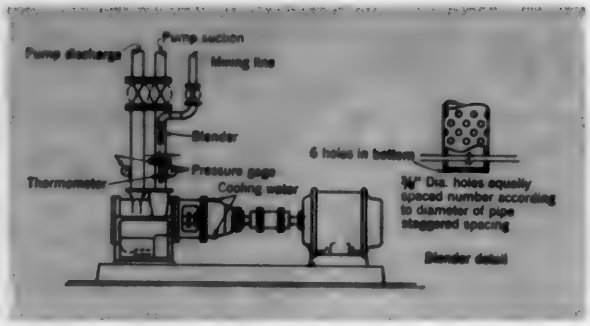

Fig. 16. Detail of mixing connection.

When calculating the capacity of the pump in terms of gallons per minute, the density of the water at the maximum and minimum temperatures must be taken into consideration.

Two or more circulating pumps should always be installed according to the load, one pump acting as a standby in an emergency, since circulation is absolutely necessary at all times. Such an arrangement will also enable one pump to be used during light loads. In larger systems a number of pumps can be used, as in Fig. 14 and 15, each pump connected into a separate line but so inter-connected that the standby pump can be thrown into any line when necessary. If steam is available, and there is any danger of electrical breakdown or interruption of service, a steam turbine driven pump should be used as a standby unit.

In early high temperature water designs, the location of the pump gave rise to much discussion. In low temperature, low pressure water systems, i.e., for space heating, the circulators are placed in the return line. In the early days it was thought this was preferable for high temperature water systems also. But it was soon proved and is now accepted as standard practice, for the pumps to be placed in the supply line to maintain the pressure above the flash point of the water, that is, to prevent steam from forming. To prevent this flashing or cavitation at the pump, a mixing connection as is shown in Fig. 16 reduces the temperature yet maintains the pressure of the system.

Fig. 15. Return pumps at McGuire are 40 hp each and controlled at a central station.

Mixing

For example, when the temperature of the water leaving the expansion tank is 350 deg at a pressure of 118 psig, the water can be reduced 10 to 15 deg by mixing some of the cooler return water. The temperature of the circulating water at the pump suction will then be 335 deg but at the same pressure of 118 psig, and flashing will be avoided.

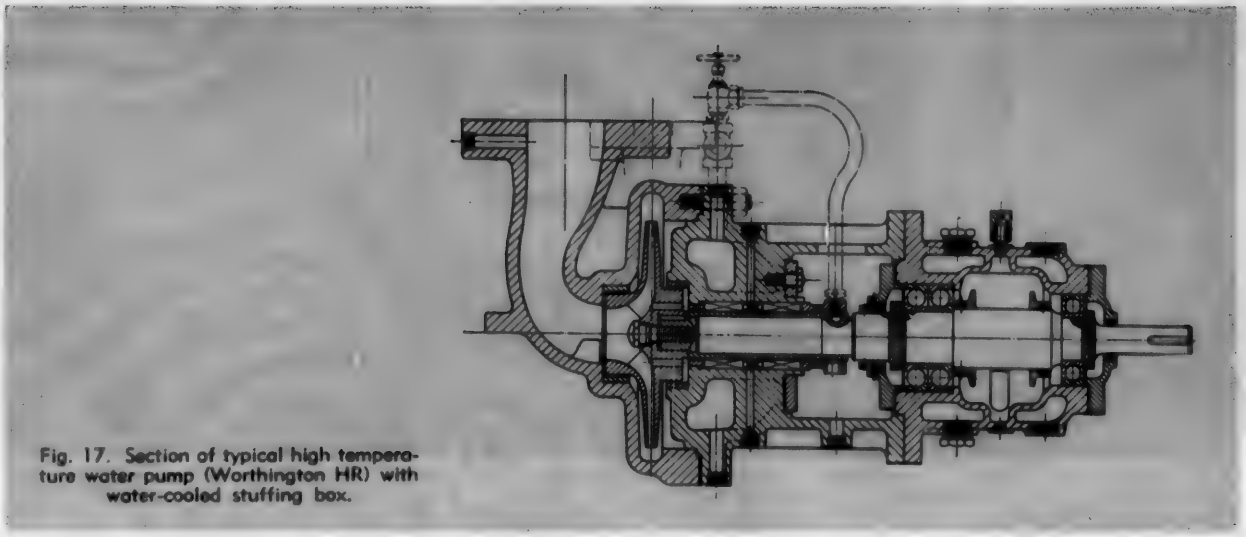

Fig. 17. Section of typical high temperature water pump (Worthington HR) with water-cooled stuffing box.

This mixing line not only serves the purpose of adjusting the pressure-temperature relation at the pump, but also can be used to control the temperature of the outgoing supply water according to changes in heat requirements in the system and climatic changes. The mixing line must be sized carefully to give a correct mixing over the whole temperature range. While this mixing valve can be thermostatically controlled if necessary, it has been found in practice that manual operation is to be preferred.

In the selection of pumps, the following covers a general requirement of construction. Below 150 psig, the pump casing can be close grained cast iron, but steel is better. For pressures over 150 psig, the pump casing must always be steel. The bearings, housing, glands and stuffing box must be water cooled. The suction inlet should be shaped to avoid sudden flow and velocity changes and to prevent cavitation. Typical high temperature water circulation pump is shown in Fig. 17. Mechanical seals are preferred for high temperature water because they are more durable under the extreme load conditions in the prevention of leakage.

While boiler circulating pumps are essential to maintain circulation in some water tube boilers, their use is to be depreciated, as adding to the equipment in the boiler house, especially as there are water tube boilers which do not require boiler circulating pumps.

Treatment Plant

In a steam plant, losses such as steam lost to atmosphere, through leakage, evaporation at the hot-well, loss of condensate, steam heating by direct injection into tanks and continuous blowdown, must be made up by additional feed water. All this feed water must be treated chemically to provide softened water and prevent scale formation.

With the high temperature water system, this loss of water is neglible. Since there are no blowdown losses, the amount of make-up water even in very large systems amounts to only a few gallons a day. Theoretically, as the high temperature water system is a closed circuit, the water is recirculated continuously and, once the initial salts in the water have been precipitated, there will be no further need for water. But due to the slight leakages at pump flanges and valve stems it sometimes is necessary in very large systems to consider a small base exchange water treatment plant. In small high temperature water systems, feed water treatment is unnecessary and should not be installed.

Deaeration plant in the boiler house is also unnecessary as air bottles are fitted at many points in the distribution lines and air is vented continuously.

Distribution system design, local services and economics of high temperature water will be discussed in two more reference sections to be published in subsequent issues.

Fig. 18. Completed boiler plant at McGuire Base.

Freon, oxygen, and acetylene flow through overhead lines to various points of use in the new air conditioning plant of Westinghouse Electric Corp. in Staunton, Va. Oxygen is delivered in liquid form to a 100,000 cu ft spherical tank. It is converted to gas at 60 psi and piped through the plant. Acetylene is supplied by two 500-lb automatic carbide generators housed outside the plant; it is piped through the plant at 15 psi.

Glass floor for world's largest dome is being installed under skating rink of the new Charlotte (N. C.) Coliseum. Aluminum foil is placed over the insulation and then 7 in. of concrete; wrought iron coolant pipes will be 2½ in. below the finished surface. Made by Pittsburgh Corning Corp., the glass insulation has a compressive strength of over 7 tons per sq ft. The floor is designed for events ranging from ice hockey to circuses.

PICTURE PARAGRAPHS

(Left) Enormous banks of Trane water coils installed in the Ames unitary plan wind tunnel, at Moffet Field, Calif., are used to control the temperature of air circulating through a supersonic wind tunnel. When the tunnel is running at top speed, 54,000 gpm of water pass through the coils. The 70-ft diameter of the aftercooler shell pictured here is apparent from the size of the man at bottom. Largest coil unit is 16 ft long by 40 in.

(Below) Many of the elements supporting the selection of floor-type radiant heating in classrooms are apparent in this view of kindergarten youngsters at Slater Road Elementary School, New Britain, Conn. Comfort conditions created by heated water circulating through Byers wrought iron pipe coils buried in the concrete floor permit maximum use of the area for teaching and recreation.

(Below) This poured concrete dome covers about 10,000 sq ft of unobstructed drill area in a National Guard Armory at Lawton, Okla. Sprayed over the dome's porous surface is a white coating based on Bakelite vinyl resins for protection against the weather. Additional coats build up a reflective surface to aid in keeping cool inside temperatures. Twenty-four smaller domes, made of clear plastic, dot the 112-ft diameter dome and help illuminate the area.

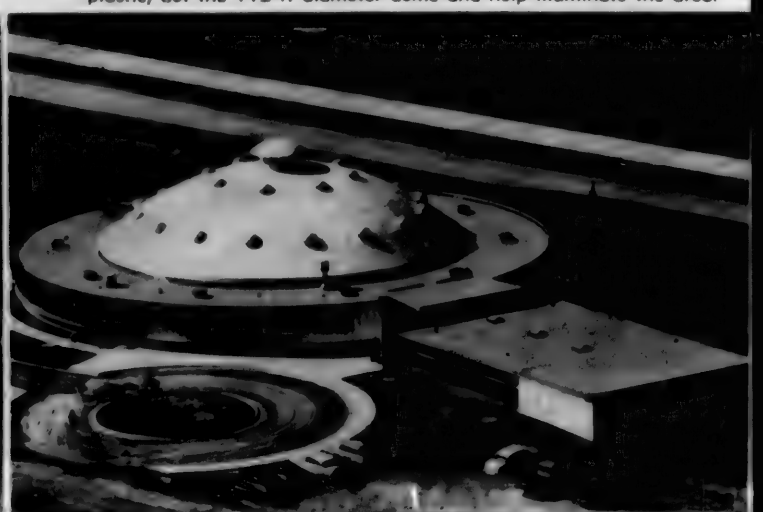

Fig. 1. West elevation of the new Chevrolet Spring and Bumper Plant. The plating area is located within the two-story section at the right.

Air Conditioning and Ventilating a Spring and Bumper Plant

LEO BRATT

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Because of extensive heat treating and plating areas in the new Chevrolet Spring and Bumper Plant, large quantities of air are supplied for air conditioning and ventilating. Systems installed for the various plant areas and offices are described.

THE Chevrolet Division of General Motors Corp. has opened its new Spring and Bumper Plant at Livonia, Mich., a suburb of Detroit, Mich. Located on a 130-acre site, this plant contains 814,000 sq ft of floor space. It is the twenty-ninth one in the company's nation-wide manufacturing and assembly facilities.

This project, Fig. 1, designed by Albert Kahn Associated Architects & Engineers in close collaboration with the owner's representatives, consists of three structures—a one-story manufacturing building, an attached two-story office building, and a separate power house. The plant is highlighted by the ventilating and air conditioning facilities designed to provide for maximum cleanliness and desirable working conditions. Three million cubic feet per minute of fresh air are discharged into the plant.

The plant is approximately 640 ft wide and 940 ft long. The office area is 540 ft long and varies from 40 to 80 ft in width on the first floor and from 40 to 60 ft in width on the second floor, with the east wall of the office forming the west wall of the factory.

Employee facilities, including kitchen, cafeteria, dining rooms, and toilet and locker rooms, are located on a mezzanine floor in the factory area with access by an overhead pedestrian passage to the office area and by stairs and escalator to the first floor factory area.

The factory is divided into a number of sections, each arranged to operate independently of the other and at varying production schedules.

Due to the nature of the manufacturing operations and the flexibility designed into the manufacturing process, it was equally necessary to have the same flexibility in the building facilities, which were to include the make-up air required for process exhaust and furnace combustion, as well as the air required for heating, ventilating and air conditioning.

To accomplish the necessary flexibility, each of the factory areas is served by several identical supply fan systems, each of which is equipped with a manually operated inlet (vortex) damper. Air can be supplied to any given area as required for full or reduced manufacturing operations by operating only part of the supply systems or by varying the capacity of the fans by an adjustment of the inlet dampers.

Plating Area

The plating area, 540 ft long by 160 ft wide, is a two-story high section located at the southeast corner of the building. The second floor area houses the automatic electro-plating lines, motor generator rooms, conveyor equipment, dust collectors and exhaust fans. Located on the first floor are the lower sections of the plating tanks, storage tanks, process piping, exhaust ducts and pumps.

A total of 1,040,000 cfm of air can be delivered to the second floor plating area by 16 identical supply fan systems. The number of systems to be operated and their capacity is determined by the amount of air being exhausted through the plating process exhaust system. Duct

work located in the truss space distributes the air uniformly over the area through wire screen outlets. Hand operated, opposed blade volume dampers are located behind each outlet. A group of fans serving the plating room are shown in Fig. 2.

The motor generators, Fig. 3, are located on the second floor of the plating area within dust-tight rooms. Clean fresh air is discharged directly on the rotors by three 98,000 cfm supply fans. The warm air is exhausted from the rooms at the ceiling through registers connected to exhaust fans located above the ceilings of the motor generator rooms. The exhausted air can be discharged to the outdoors in mild weather or into the plating area in cold weather. A hand operated damper positioning switch is provided for control of the dampers from the second floor level.

The first floor plating area is ventilated in mild weather by six 25,000 cfm supply units of the suspended type. The air is discharged into the area through ducts along the inside wall and is exhausted through open windows along the outside wall. No winter mechanical ventilation is provided in this area as only a small amount of maintenance work is necessary.

Buffing and Polishing Areas

Eighteen supply fan units of the suspended type, each with a capacity of 25,000 cfm, are used to provide make-up air to the buffing and polishing areas. The air is exhausted at the buffing and polishing machines through ducts by centrifugal type wet dust collectors. Provisions are made for recirculating a large part of the air for winter operation.

Heat Treating Areas

When the ventilation for the heat treating areas was under discussion with the owners, their principal interest was in the comfort of the workmen. The owners wanted the men working in the hot areas around the furnaces to have individual control of the air movement around them.

A device we call a man-cooling outlet was designed that has since proved very effective. The outlet is constructed in such a manner that it can be adjusted to discharge the air from an under-floor duct through the side outlet which can be rotated in 15 deg increments through a range of 360 deg or out the bottom around the outlet. The workman can adjust the air outlet to discharge air directly on him, to either side of him, or not on him at all, as he chooses. All of the air supplied for man-cooling through the outlets is also required for make-up air in the area. In the event the workman does not want the air discharged on him, he can close the side outlet dampers and the same quantity of air will be discharged on the floor around the outlet. Interlocked hand operated dampers at the side outlet and at the top of the inner air passage control the direction of air flow. The outlets, Fig. 4, are installed near the workman and in a position which will blow the smoke and heat from the furnaces away from the man and into the exhaust hoods.

The coil spring heat treat area is a flat roof section at the northeast corner of the factory directly behind the office. Unheated air is conducted to the man-cooling outlets through an under-floor concrete duct by a 50,000 cfm supply system. Fresh air is also supplied to the area by three 50,000 cfm supply systems through ducts located in the truss space. The fresh air outlets on the overhead ducts are wire screened with opposed blade dampers. The air supplied to the area through the overhead duct systems can be recirculated for heating during factory shut-down periods. Hoods over equipment and furnaces giving off smoke and heat, together with power roof ventilators provide the necessary exhaust from the area.

The leaf spring heat treat area is located at the southeast corner of the building and is 240 ft wide by 360 ft long. The roof over the four 60-foot wide bays is of the

Fig. 2. Supply fans for the plating room. Air filter oil cleaners are along the right wall.

Fig. 3. Fresh air supply ducts discharging on rotors in the motor generator room.

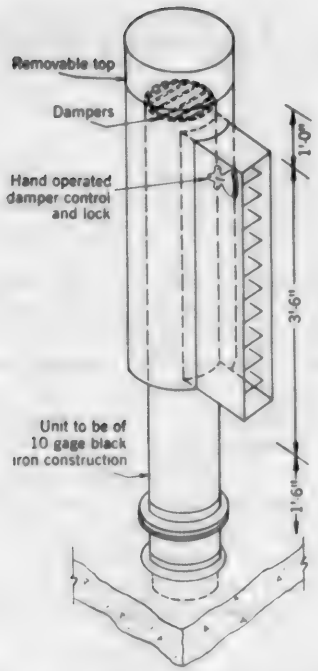


Fig. 4. Details of the man-cooling outlet.

Fig. 5. Exhaust plenum above lockers in locker room.

cathedral type with a continuous ridge type ventilator on each ridge. Eight supply fan systems, each with a capacity of 50,000 cfm are located on platforms in the truss space at the east end of the area. Two of these supply fan systems deliver air around the perimeter of the area to form an air curtain. The remaining units discharge into an under-floor concrete duct system with floor and man-cooling type outlets. The air supplied by these units can be recirculated for heating during factory shut-down periods.

Three supply fan systems in a fan room on the north side of the area deliver 330,000 cfm of unheated air through an under-floor concrete duct system to man-cooling outlets serving high heat areas. Hoods over equipment and furnaces giving off heat and fumes, and the ridge ventilators provide the necessary exhaust.

Office Area

The executive, personnel and engineering offices, first aid and chemical and physical laboratories are located on the first floor. On the second floor are the general, purchasing and accounting offices and conference rooms as well as two equipment rooms and electrical sub-stations.

The ceiling of the office areas is of the luminous plastic type with a secondary ceiling of reflective aluminum, below which the lights are mounted. All of the supply, recirculating and exhaust air ducts are installed above the secondary ceiling with connections to diffusers or exhaust outlets dropping straight down through both ceilings to prevent shadows. Fresh cool air is delivered to the rooms through ceiling diffusers or side wall registers, depending upon the construction and room arrangement.

The space between the secondary ceiling and the floor slab of roof above is used as an exhaust plenum. Exhaust air is admitted to the plenum through ceiling outlets or through perforated sections in the luminous plastic ceiling. Openings through the reflective aluminum ceiling are provided for air movement into the exhaust plenum.

Two equipment rooms house the air conditioning and ventilating equipment, each serving approximately one half of the office area. The entire office is air conditioned under zone control by ten refrigerant condenser units and direct expansion cooling coils. A cooling tower located on the roof provides the condenser water.

Kitchen Cafeteria Area

The factory employees' cafeteria is provided with supply and exhaust ventilation by a 27,000 cfm central supply and recirculating fan system. Provisions are made for the future installation of cooling equipment. The office employees' cafeteria is served from one zone of these systems with cooling and back-heating coils for present cooling. A packaged air conditioning unit and recirculating air fan serve the private dining room.

The kitchen area is maintained at a negative pressure by providing less supply air than is required for exhaust. Double forced grilled openings between the cafeteria and kitchen provide a passage for the additional air required for kitchen exhaust.

Locker Rooms

Fresh air is supplied to the locker rooms through

Fig. 6. Office fan room showing refrigeration compressors and piping.

Fig. 7. Supply, recirculating and exhaust fans in the office fan room.

registers located in the sides of the exposed supply duct running in the truss space.

The lockers are used as the exhaust outlets. Each locker is provided with louvers at the bottom of the door and a perforated top, Fig. 5, over which an exhaust duct is connected. Additional air is exhausted from the room at the ceiling to prevent the accumulation of heat.

Substations

Each substation is provided with filtered outdoor air at a rate to maintain a temperature rise of not more than 20 deg above ambient air temperature. Roof ventilators interlocked with relief dampers opening into the factory area provide for adequate exhaust. The relief dampers open when the roof ventilator is not operating and the heated air passes into a negative pressure area of the factory space for heating and make-up air. In warm weather the air is exhausted to the outdoors through the roof ventilator.

Air Conditioning Equipment

Two equipment rooms, Fig. 6, house the air conditioning and ventilating equipment, Fig. 7, for the entire office. The office space is zoned as required by exposure, occupation and use.

Fresh air is drawn into the building by centrifugal type fans, passed through automatic oil air filters and over direct expansion cooling coils, and is then discharged over the back-heating zone coils through a duct distribution system to the areas served.

Where conditions permit, there are provisions for recirculating up to 80% of the air supplied.

Cooling is provided by ten 25-ton Frigidaire condensing units and direct expansion cooling coils. A cooling tower located on the factory roof cools the condenser water. For summer conditioning, temperature of the air entering the building is cooled for humidity control and is back-heated with steam coils to desired comfort.

Equipment

The automatic operation and temperature control for all of the air conditioning and ventilating equipment is accomplished by a pneumatic system provided exclusively for that purpose.

All of the fresh air supplied within the building, with the exception of the suspended units serving the buffing areas, is passed through automatic oil air filters. To reduce maintenance and oil replacement cost, each bank of air filters is equipped with an oil cleaner unit.

Darin & Armstrong, Inc., Detroit, Mich., was the general contractor, and J. Brodie & Son, Inc., Oak Park, Mich., ventilating contractor.

Chart for Judging Smoke Density Reissued

Responding to increased public interest in air pollution problems, the Bureau of Mines has just issued a new edition of the Ringelmann smoke chart, a standard guide often used in developing and enforcing smoke-control regulations.

Named after its originator, Prof. Maximilien Ringelmann of Paris, the first chart was prepared more than 50 years ago and today is widely used as the standard for determining the density of smoke from industrial and commercial stacks and other installations.

The chart consists of special cards which appear as graduated shades of gray when mounted some distance from an observer and in line with the stack or chimney being observed. The observer then determines which shade of gray most nearly matches the smoke coming from a stack. Many smoke-control regulations list violations in terms of the duration of smoke emission and the density as compared with the Ringelmann scale.

According to a Bureau circular accompanying the Ringelmann chart, the standard was introduced to the United States in a magazine article in 1897. In 1904 it was employed by engineers of the Technologic Branch of the Geological Survey (later the nucleus of the present Bureau of Mines) in studies at St. Louis. By 1910, the Ringelmann chart gained additional prestige when the Massachusetts Legislature recognized it officially in a smoke ordinance for the city of Boston.

The Bureau's new publication describes use of the scale and contains a chart for making observations of four densities of smoke, ranging from No. 1 to No. 4. Omitted are No. 0, a clear stack, and No. 5, wholly black smoke.

Single copies of I. C. 7718, Ringelmann Smoke Chart, by Rudolph Kudlich (revised by L. R. Burdick), containing one copy of the chart itself can be obtained from the Bureau of Mines, Publications-Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pa.

What Would You Do?

Replies to engineering and operating problems of interest to the industrial plant engineer

Conducted by
NATHAN N. WOLPERT
Associate Editor

This Month's Problem

Were I a ventilating engineer, this question would not be asked. But as a new plant engineer, I have been checking on existing dust collecting equipment here as management would like some changes. Are there any rules that govern when one type should be used and not another? What are some of the characteristics of common types?

THERE are various types of dust collecting equipment available, each capable of handling specific conditions in a plant and for various types of dusts. There are a large number of companies that make dust collecting equipment and therefore, there are many designs.

The subject of dust collecting equipment is discussed in this issue, and the problem is given in a box on this page. Should you have a problem that you would like to see discussed in this department, or if you have some comments that you would like to add to the coming discussion, you are invited to write to the Editor.

Discussion of the Problem

Dust collection equipment is available in numerous designs utilizing a number of principles, and featuring a wide variation in effectiveness, first cost, operating and maintenance cost, space, arrangement and materials of construction. Consultation with the equipment manufacturer is the recommended procedure in selecting a collector for any problem where extensive previous plant experience on that specific dust problem is not available.

Most collectors can be grouped into one of the three following classes, namely: (1) high efficiency, high cost; (2) high efficiency, moderate cost; (3) lower cost and lower efficiency designs.

One safe recommendation in equipment selection can be summed up as: Select the collector that will allow the least possible amount of contaminant to escape and still be reasonable in first cost and maintenance. For some

TABLE 1—COMPARISON OF SOME IMPORTANT DUST COLLECTOR CHARACTERISTICS

Type	Higher Efficiency Range on Particles Greater than Mean Size in Microns	Pressure Loss, Inches	H_2O Gal per 1,000 CFM	Space	Sensitivity to CFM Change		Humid Air Influences	Max. Temp., F., Standard Construction
					Pressure	Efficiency		
Electro-Static	0.25	½	-	Large	Negligible	Yes	Improves efficiency	500
Fabric:								
Conventional	0.4	3-6	-	Large	As cfm	Negligible	May make recondi-tioning difficult	180
Reverse Jet	0.25	3-8	-	Moderate	As cfm	Negligible		200
Wet:								
Packed Tower	1-5	1½-3½	5-10	Large	As cfm	Yes	None	Unlimited
Wet Centrifugal	1-5	2½-6	3-5	Moderate	As (cfm)[2]	Yes		
Wet Dynamic	1-2	Note 1	½ to 1	Small	Note 1	No		
Orifice Types	1-5	2½-6	10-40	Small	As cfm or less	Varies with design		
Higher Efficiency:								
Nozzle	0.5-5	2-4	5-10	Moderate	As (cfm)[2]	Slightly to moderately	None	Note 2
Venturi	0.5-2	12-20	-	Small				Unlimited
Dry Centrifugal:								
Low Pressure Cycle	20-40	¾-1½	-	Large	As (cfm)[2]	Yes	May cause condensa-tion and plugging	750
High Eff. Centrif.	10-30	3-6	-	Moderate	As (cfm)[2]	Yes		750
Dry Dynamic	10-20	Note 1	-	Small	Note 1	No		750
Louver	15-60	1-3	-	Small	As (cfm)[2]	Moderately		750

Note 1: A function of the mechanical efficiency of these combined exhausters and dust collectors.
Note 2: Precooling of high temperature gases will be necessary to prevent rapid evaporation of fine droplets.

Problem for the Coming Issue

For a hot water heating system, can you tell me of a method, not too complicated in approach, that can be used for sizing an expansion tank to go with the heating system?

applications, even the question of reasonable cost and reasonable maintenance must be sacrificed to meet established standards for air pollution control or to prevent damage to health or property.

Dust collectors are currently manufactured by 50 or more companies in the United States alone. Designs are varied, often employing more than one of the known principles of separation of a solid, fume, mist or vapor from a gas stream. Each year a number of new designs are introduced, many of which find their application range after a shakedown period, between the fond hopes of the inventor and the realities of the maze of factors that influence successful performance for the different problems encountered.

Table 1 gives a comparison of some important dust collector characteristics.

Here are a few "don'ts" that may be of value when dealing with dust collectors.

1. Don't put two collectors of the same order of efficiency in series. The second collector will not remove enough material to alter discharge appearance, public nuisance complaints or settlement in plant area unless the initial unit is not functioning satisfactorily. Exceptions could include installations where agglomeration of particles are involved, or where a second collector is used to remove material concentrated in a carrier air stream from the first collector.

2. Don't expect collectors employing principles used for lower efficiency primary collection to be developed that will give efficiencies equal to those of more expensiev and high efficiency units.

3. Don't attempt to recirculate cleaned air from dust collectors handling toxic material without careful investigation of the policing required to be assured of maintained effectiveness.

4. Don't install unit collectors on heavy duty production operations without careful evaluation of the frequency of servicing that would be required.

This information was obtained through the cooperation of John M. Kane, Manager, Dust Control Division, American Air Filter Co., Inc., Louisville, Ky.

A Previous Problem

The following replies are in answer to a previous problem dealing with a system for chilling water which uses a flooded evaporator. Questions asked were: What should be the superheat setting of the expansion valve? In figuring the size suction connection to the refrigerant shell around the water tubes, what should be the pickup velocity at low load conditions? Under what conditions, if any, will there be trouble with oil return?

An expansion valve should not be used with a flooded evaporator system. Either a high side or low side float valve is satisfactory. With the flooded evaporator, there is no superheat and it is necessary to provide a surge drum or a suction gas heat exchanger to prevent slugging liquid back to the compressor.

The return line should be taken off the top of the evaporator and baffled to minimize entrainment of oil or liquid refrigerant. A low gas velocity should be used at this point.

Oil return may cause trouble at low loads. The Trane Air Conditioning Manual has an excellent chapter on pipe sizing with recommended velocities. Double piping of the suction riser is recommended where large variations in load are encountered.

With the flooded evaporator, there may be some tendency for oil to separate and settle to the bottom. An oil trap and drain may be installed to take care of this condition although, with Freon refrigerants, the oil tends to stay in solution.

Roger W. Haines
Bridges and Paxton
Albuquerque, N. M.

Many of the flooded chillers are float fed with either high or low pressure (direct acting or pilot operated) floats. These must be provided with some auxiliary means to return oil to the compressor because a surge space is generally provided in the upper portion of the chiller for separation of liquid from the gas to prevent liquid carryover to the compressor. The surge space creates the desired low velocity area, allowing good liquid separation, but at the same time, oil return is discouraged. Although some oil will be returned in fine droplet form, it cannot be depended upon to provide the necessary return, particularly at low loads when the ebullition subsides and the gas velocities are reduced. Consequently, a means is provided to return a mixture of the Freon and oil to either the suction line or an oil still, heated with either electricity, warm liquid refrigerant or hot gas, from which it flows to the compressor crankcase or an oil receiver to replenish the crankcase as needed.

With thermal expansion valve fed flooded chillers, less liquid separation space is provided since it is inherently necessary that some liquid, containing oil, splash into the suction line where it will ultimately reach the compressor.

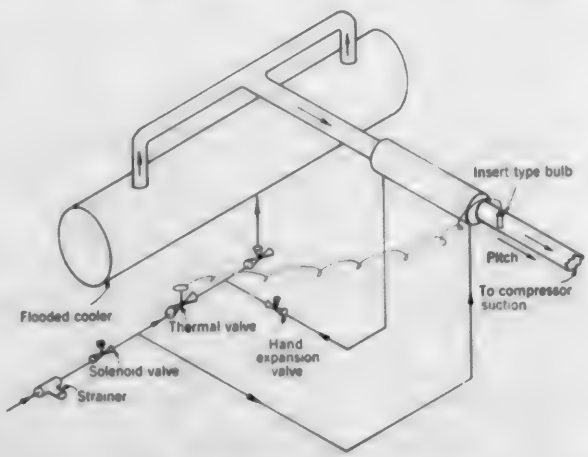


Fig. 1. Thermal valve flooded chiller.

A superheater must be provided to evaporate the liquid, while in turn, the oil can flow through the suction line to the compressor.

As to carrying oil up a vertical riser, our experience has been that for air conditioning temperatures, the vertical velocity should be maintained at 1,000 fpm or more. For lower temperature systems, such as brine cooling, considerably higher velocities are required. This means that the vertical suction take-offs from the chiller should be sized so that at the minimum loading, the gas velocity through all of the risers will be at least 1,000 fpm. For horizontal suction lines, the velocity is not nearly as critical and the line can be sized for the pressure drop allowances of the system. However, any horizontal run should be pitched in the direction of flow, ¼ in. per foot or more.

The thermal bulb must be located on the downstream side of the suction line superheater (side of suction line away from the chiller). This is necessary to provide a source of superheat to actuate the thermal expansion valve; superheat can be gained in the chiller only by starving it and consequently, reducing its cooling capacity. The location of the thermal bulb at this point presents a problem in that a cycling of the thermal valve will result if the piping and controls are not treated properly. It can be seen that while the valve is feeding, there is flow and a source of heat through the superheater to boil off the liquid mixed with the suction gas. However, when the valve overfeeds, the bulb feels the cooler suction gas and closes, thus stopping the liquid flow with its source of heat. Now with no warm liquid flowing through the superheater, the suction gas will be without superheat until such time that the evaporator has become starved and the thermal valve can again open. Obviously, this will cause a hunting of the control valve, resulting in poor control and chiller performance.

The best known solution of overcoming the thermal valve cycling is to bypass some liquid around the thermal valve, through a hand expansion valve, to provide a steady flow of liquid through the superheater coil at all times. See Fig. 1. Then the thermal valve control is independent of any effect of a variable heat source to the suction gas. The hand expansion valve is set for a flow rate below the minimum required for reduced load operation. Then the thermal valve can control throughout the full range of compressor capacity without fear of overfeeding at any given load condition. A solenoid valve is located in the liquid line at some point upstrem from the hand expansion valve and wired to close during shutdown, so that no leakage will result when the system is idle.

The superheat setting on the thermal valve will vary from job to job, depending upon a number of variables, but in general should be set for between 10 and 15 deg F at the full load condition.

J. R. Harnish
Engineer, Applications Dept.
York Corp.
York, Pa.

Problems in Air Conditioning Existing Building

Air conditioning systems were recently installed in an existing structure in the Cunard Building at 25 Broadway, New York City, at a cost of more than $3,000,000. The 22-story building, a landmark in the lower Broadway area, has a net rentable space of 580,000 sq ft and over 100 tenants.

The engineering for this project commenced in April, 1953. The actual installation was completed in 11 months, with most of the work being done during normal business hours and overtime reduced to a minimum.

The building management decided to act as its own general contractor and subsequently awarded a contract to Kirby Saunders Inc. for the complete installation of the building's air conditioning system.

The installation consists of a central refrigeration plant located in the sub-basement made up of two steam turbine driven centrifugal York compressors of 935 tons each. Chilled water is distributed through 16-inch supply and return lines.

In order to meet city requirements, it was necessary to erect a cooling tower on the roof. This was installed without the need for extra support when the existing steel was determined to be more than adequate to carry the additional load. The tower is also supplied by a 16-inch supply and return.

How to get these lines and the supply of fresh air through the building to the air handling units presented a problem. Rather than construct a shaft through the various floors, it was decided to utilize two elevator shafts for the chilled water risers, as well as for the fresh air supply. The problem was further simplified by an existing ventilation shaft which was used to run the condenser water pipes.

Originally, the intention was to install the conventional system of air distribution throughout the building, with one central air handling unit on each floor. However, three of the building's major tenants occupying floors 12 to 22 preferred a system that would allow more individual control. After a further engineering survey, it was agreed to install the fan-coil system on these floors, thus permitting individual control at each unit. This change resulted in the major problem of having to pipe chilled water to each of the 56 risers at the 11th floor and was only accomplished through the great co-operation of the tenants involved.

Another difficulty was the air conditioning of the Great Hall, one of the show places of lower Manhattan. This hall is approximately 65 ft by 185 ft and is four stories high, with an ornate, domed ceiling. It was serviced very successfully when the existing ductwork was utilized.

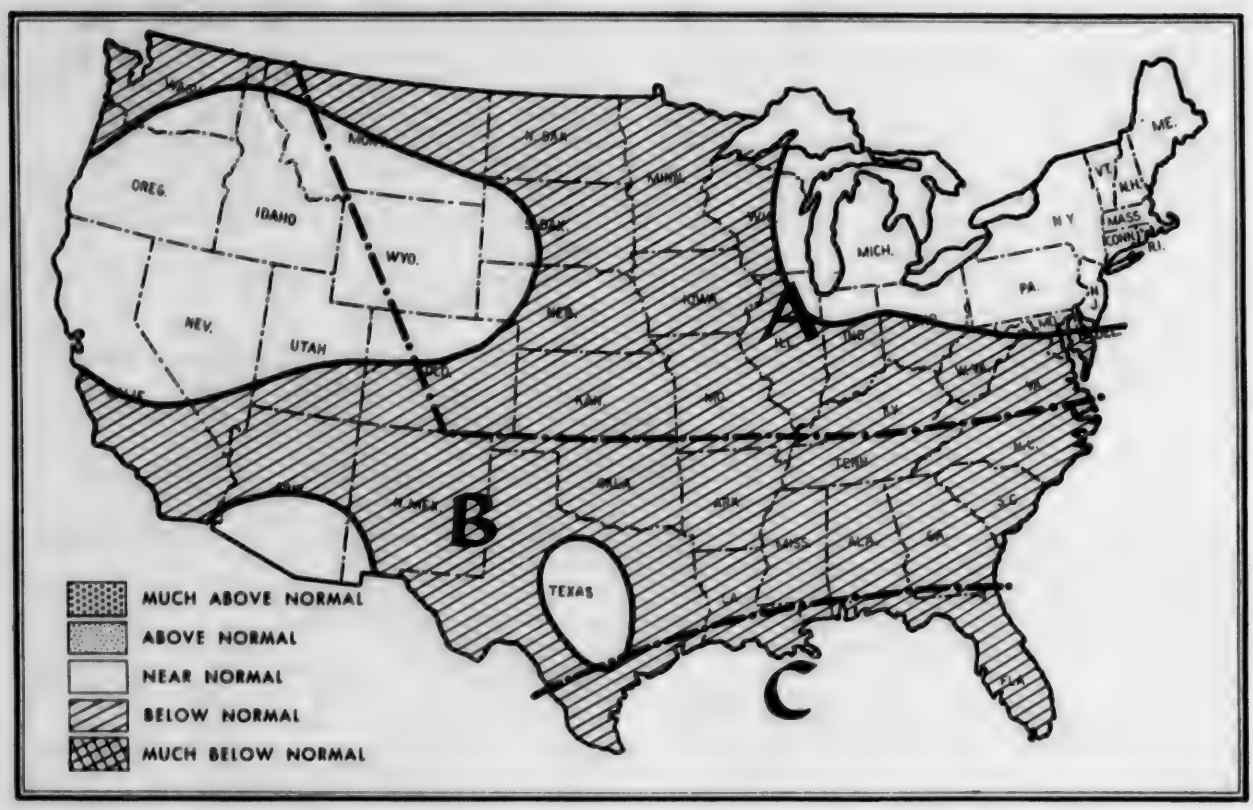
An unusual aspect of the installation is the IBM electronic control board used for the starting and stopping of all air handling and fan-coil units. It is believed to be the first installation of its kind applied to an air conditioning plant.

During the off-season, a 100% supply of fresh air is delivered throughout the building. During the heating season the upper floors have hot water circulating through the fan-coil units and tempered fresh air is supplied by the primary air handling unit. The lower floors retain their original heating system supplemented by 25% tempered fresh air.

Temperature Forecast for September

Prepared for Air Conditioning, Heating and Ventilating

by Long Range Weather Consultants



KEY BY REGIONS

	A	B	C
NEAR NORMAL	+ 1° to − 1°	+ 1° to − 1°	0°
BELOW NORMAL	− 2° to − 4°	− 2° to − 3°	− 1° to − 2°

EXCEPT for northwestern Washington and southern California, temperatures are expected to average near normal over most of the Northwest. Central Texas and southern Arizona will have near normal temperatures as will the Northeast as far west as the Great Lakes. The remainder of the country will experience below normal temperatures.

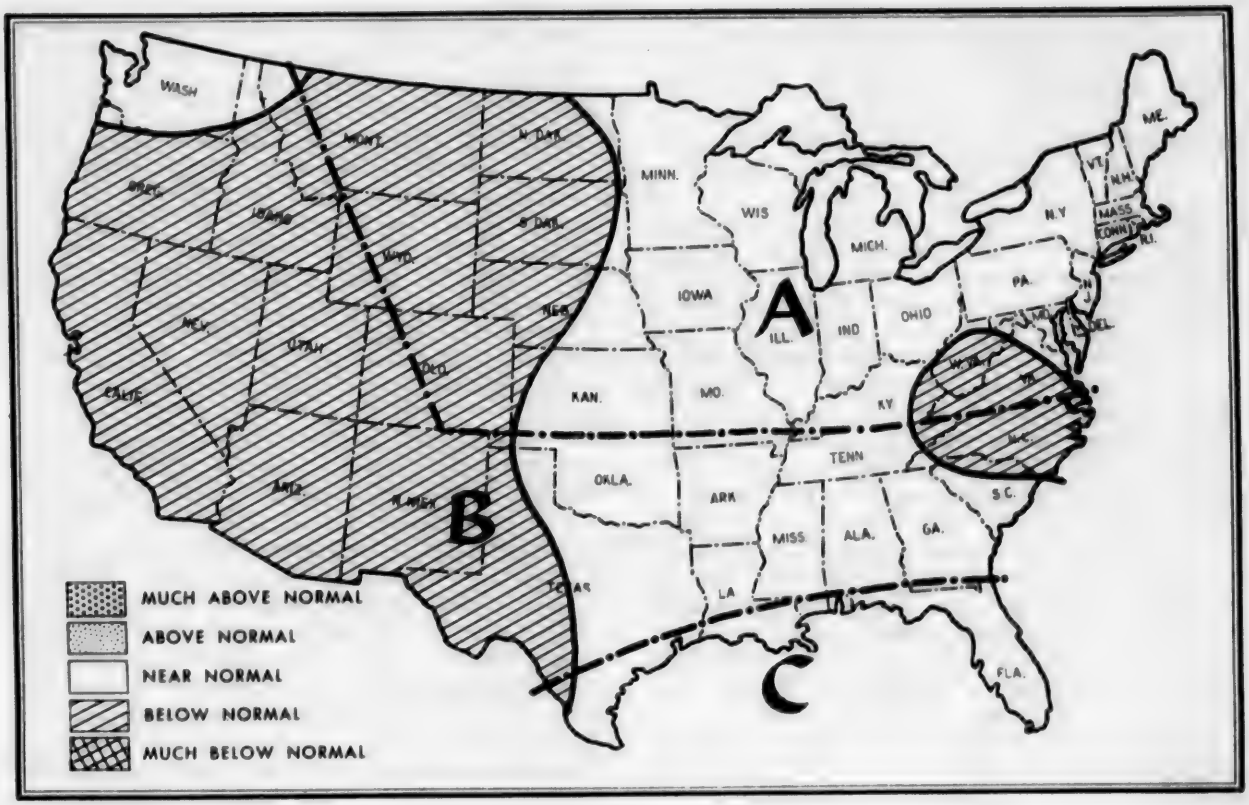
The largest departures from normal will occur in a belt through western South Dakota, Missouri, Indiana, Illinois eastward to the Virginia shore, and will run as much as 4 deg below normal.

Because of the increased awareness of hurricanes on the part of the general public, it seems pertinent to point out that in a forecast of this type, hurricane paths cannot be predicted, but since their affect on average monthly temperatures is negligible, the forecast is not affected by this factor.

Temperature Forecast for Fall

A forecast for the September, October, November quarter, 1955

Prepared by Long Range Weather Consultants



KEY BY REGIONS

	A	B	C
NEAR NORMAL	+ 1° to − 1°	+ 1° to − 1°	+ 1° to − 1°
BELOW NORMAL	− 2° to − 3°	− 2° to − 3°	− 2°

FALL will begin as rather cool (relative to the normal) throughout most of the country except the Northeast and West (note September forecast). October and November are expected to be increasingly colder in the western half and warmer in the east. The average Fall temperatures will be mostly near normal (departures ranging from −1° to + 1°) in the eastern portion of the country and below normal (departures from normal of −2° to −3°) in the region west of the Plains. There are only two exceptions, one being the far Northwest which will be near normal, and the other in the Southeast. The latter area (West Virginia, Virginia and portions of Kentucky, Tennessee, North Carolina, and South Carolina) will be below normal.

Fall is a season of transition from summer to winter, and temperatures typical of both seasons may occur over a short time period. Thus the day to day and week to week temperature changes may be quite variable.

LOUIS BLENDERMANN ON

PIPING AND PLUMBING

Importance of Cleanouts in a Building

AFTER the plumbing work in a new building has been completed and the building is occupied, problems connected with maintenance begin. One phase of the maintenance work concerns the clearing of stoppages that may occur in a part of the plumbing drainage system due to any of a number of reasons. A few of the more common causes are:

1. Foreign objects lodged in the drainage line.
2. Accumulation of hair or other matter.
3. Deposits of grease fat or other substance.

Such objects can completely block the discharge through the drainage lines or at least reduce the effective flow. Blockage of the lines can, in the case of a complete stoppage, cause considerable water damage to the lower floors and contained equipment when the waste water backs up. Partial stoppages can create sluggish discharge conditions in the drainage lines that interfere with the proper venting of the drainage system which will result in the discharge of foul odors in the rooms or areas. This is always a dangerous condition since when the capacity of the venting is unbalanced, siphoning of the trap seals will result.

Therefore, to avoid these troublesome conditions, certain considerations must be given to the cleanouts during the design stages to ensure complete access to all parts of the drainage system. Well planned points of access will permit the clearing of stoppages after the building is erected. Various cleanouts are illustrated in Fig. 1, and the purpose of each cleanout will be described.

The location of the cleanout governs the type cleanout that is installed.

Cleanouts

Roof stack terminal. This is often used for cleaning a stoppage that may be lodged in the vertical soil or waste stack. Sticks, stones or even rubber balls are sometimes dropped down the vent stack terminal at roof level by children. Such objects can lodge in a section of the stack, between floors and presents a stoppage that is difficult to clear. Rags, rubber toys and similar objects provide the same problem when discharged through a water closet into a soil stack. These objects can be cleared or dislodged so they fall to the base of the stack where the cleanout at this point offers easier access to the object. To dislodge the object a steel snake of sufficient length is inserted down the opening of the roof terminal until the object is reached and worked loose. This type of access is only possible when the building is not too tall, for otherwise stack cleanouts at intermittent floors are necessary.

Fixture traps. A means of clearing the waste line between the fixture and its waste connection to the vertical waste stack or horizontal waste branch is provided by fixture traps. Hair pins, safety pins or similar objects as well as accumulation of hair, soap fat or grease can cause stoppages in these lines. The fixture trap is equipped with a cleanout plug that may be removed for access purposes. By use of a snake or wire, the object can be removed or in the case of soap fat or grease accumulation, the substance can be worked loose by the motion of the wire. After replacing the plug, the line is flushed clean with hot water.

Branch soil or waste lines. Such lines are usually pro-

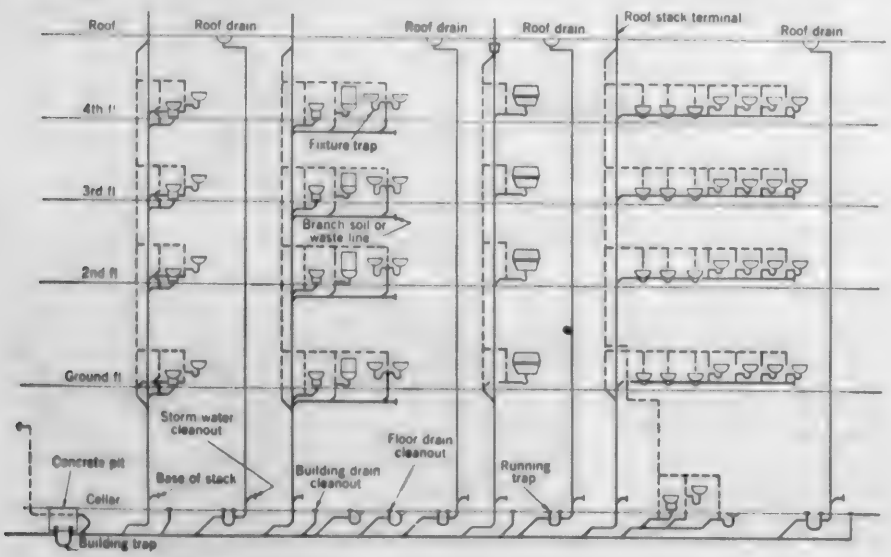


Fig. 1. A typical plumbing riser diagram to show the use of various cleanouts.

vided with a cleanout at the end of the branch. This cleanout assures access to stoppages that may develop in branch lines. Here again, the stoppages may consist of rags, rubber toys or just accumulation of soap fat or grease, especially if a sink is connected to the line. By removing the cleanout plug, the stoppages are easily cleared with the help of a steel snake. If the branch waste is installed above the floor slab, access may be provided by offsetting the cleanout pipe so that the cleanout plug will be flush with the wall. If the branch waste is installed below the floor slab, again the cleanout piping should be so arranged that the cleanout plug will be flush with the wall near the ceiling. For either installation, proper sized access doors might well be used to reach the cleanout plug.

Base of stack. A cleanout at the base of stack is quite important since foreign objects discharged or dropped into the vertical soil and waste stacks are generally trapped at this point. Such objects can cause severe stoppages resulting in considerable water damage to the lower floors. The discharge from the upper floor fixtures will back up and overflow through the plumbing fixtures on the lowest floor above the stoppage. Therefore, a cleanout at this point will offer the necessary access. Various types of manufactured cleanouts and access doors are available for use at this location.

Building drain cleanout. This type cleanout is installed either exposed on the building drain located on the ceiling of cellar or basement, or the floor level type consisting of fittings and pipe installed on the underground building drain and extending up to the floor level of the floor slab. Here again, various types of cleanout plugs and access plates are manufactured to afford the necessary access to the drain lines.

Such cleanouts are usually placed between 40 and 50 ft apart, at which distance a steel snake is more easily handled to clear stoppages in the building drain.

Building (house) trap. This type trap has a dual purpose for (1) it contains the water seal necessary to prevent the sewer gas from entering the building drainage system and (2) it serves as a cleanout for the building sewer, located between the building and the street sewer. Objects that cause stoppages in other parts of the drainage system in the building can also cause stoppages in this line. Occasionally, tree roots that enter the building sewer, constitute a more serious threat. To clear stoppages in this line, a steel snake is used. In the case of tree roots, patented devices are inserted into the line through the trap and the roots cut out and flushed out.

When the building trap is exposed, the cleanout plug is easily removed. However, when the building drain is underground, availability is offered by extending the cleanouts up to the floor level. More frequently, a concrete pit with a steel cover is constructed. This pit provides ease of access to the cleanout plugs. The concrete pit should be of a size that is proportionate to the depth of the underground building drain. This consideration will allow a man sufficient room in which to work.

Floor drain cleanouts. Such cleanouts are quite necessary where the floor drains are remotely located away from a branch waste that is normally equipped with cleanouts. The cleanout is an integral part of the floor drain, having a removable plug, thereby providing the necessary access. Many styles of floor drains with this feature are available, depending upon the particular function of the floor drain. If a drain of this type is not used, then a separate cleanout should be installed at the end of the waste line.

Storm Water System

Cleanouts are also very much required for the storm water system. Stoppages can be caused in the storm water piping by leaves, gravel, grit, stones or even small sticks dropped by children through the openings in the dome of the roof drain. These objects that can cause stoppages, usually settle at the base of the storm water stack. A cleanout in the base of the stack at this point will provide the necessary access for clearing stoppages.

If a running trap is installed at the base of the stack as shown on the drawings, it will intercept any gravel or grit that drops in the line. Such matter would otherwise accumulate in the underground line where it can cause stoppages, especially during prolonged dry spells. The installation of the running trap should be in accord with the requirements of the local code.

Floor level cleanouts should also be provided every 40 to 50 ft apart, whether or not the building storm drain is installed exposed at the ceiling of the cellar or basement, or if it is installed underground. The purpose of these cleanouts is the same as outlined for the plumbing drainage system. In general, the same careful consideration should be given the storm water system as given the sanitary system.

Room Air Conditioner Saves Critically Burned Fireman

A Chicago fire-fighter, critically burned in a hotel blaze here is alive and on the road to recovery today, thanks to prompt action by Jim Monkerud, service manager, Air Comfort Corp., a Carrier distributor.

The fireman who was hospitalized since April 28, took a turn for the worse in the near 100 deg heat that blanketed the city recently. In addition, it was a holiday week end with all firms closed.

Doctors at Henrotin Hospital recommended an air conditioning unit be placed in the patient's room to cut the humidity sapping his strength. Chiefs Robert Quinn and John Van Dorpe of the Fire Department appealed to the *Chicago American* and that paper contacted Jim Monkerud in suburban Maywood. Monkerud loaned a ¾-ton room air conditioner which was rushed to the hospital and immediately installed.

According to the nurse on duty, the fireman showed immediate improvement. She telephoned the injured fireman's home to report the air conditioner was "just what the doctor ordered."

NEWS OF EQUIPMENT AND MATERIALS

Use the convenient prepaid postcard on page 124 for securing additional information on items described in this department.

Horizontal Room Thermostat

A newly designed household thermostat is announced by Detroit Controls Corp., Detroit, Mich. Known as the Classic, it combines functional utility with modern styling that blends with any period of interior furnishings.

Departing from conventional design, the dial on the thermostat is arranged in a horizontal position and tipped at an angle which makes direct, eye-level viewing possible and eliminates inaccurate reading caused by angular vision. Large Gothic numerals are set on a satin black face covered by a polished lens. The thermometer is placed just above the numerals under the lens and shows how the actual temperature compares with the thermostat setting. A small lever located just under the dial face adjusts the room temperature.

The entire thermostat is enclosed in a satin gold case which complements the black dial and clear lens.

Another feature of the thermostat is the company's timed cycling action. This action automatically cycles the burner to maintain temperatures constant to within a fraction of a degree in order to prevent over-heating and under-heating.

The thermostat is available with either a three-wire, parallel-type heater or with an adqustable series heater with a range of from 0.4 to 1.0 amp.

More information? Circle Item 1 on postcard, page 124.

Motor for Fans or Blowers

A totally-enclosed, air-over motor, nearly 30% lighter than previous models and approximately 20% smaller, is announced by General Electric Co., Schenectady, N. Y.

Designed to produce varying horsepower with the application of varying air velocities, the non-ventilated motor is suitable to air-moving applications. The motor is cooled by the air flow over it caused by fan or blower it powers. Horsepower output can thus be increased without exceeding the rated temperature rise of the motor.

An addition to the company's line of Tri-Clad 55 motors, the air-over model has polyester film insulation, a cast-iron frame, and Formex wire stator windings for protection against heat aging and full-voltage starting stress. Mounting the motor is simplified by the location of the conduit box in the endshield, where it does not obstruct air velocity. All leads are numbered every half inch from terminal to windings for identification after the terminals are taped or the wires clipped.

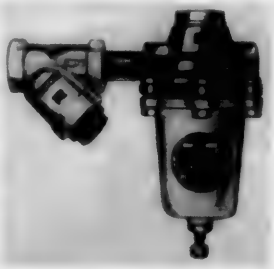
The motor is available in ½-through 5-hp ratings and in frame sizes 182, 184, 213, and 215.

More information? Circle Item 2 on postcard, page 124.

Regulator Serviced in Line

A pressure regulator, which may be serviced while in the line, has been designed by Mueller Co., Decatur, Ill.

Designated the H9300, the regulator features a seating arrangement that allows full flow without excessive pressure drop and low flow without noise or chatter. The ratio between the seat and diaphragm produces a valve action that provides rapid and positive regulation.



The regulator is available with various spring combinations for inlet pressures to 250 lb and outlet pressures from 5 to 125 lb. Offered with or without a strainer, the regulator can be adapted for water, air, or oil installations by use of optional diaphragm materials. Its sizes range from ½ to 2½ in.

More information? Circle Item 3 on postcard, page 124.

Heater Uses Gasoline or Oil

An indirect-fired, portable air heater that fires with fuel oil or gasoline is being made by Herman Nelson Div., American Air Filter Co., Inc., Louisville, Ky.

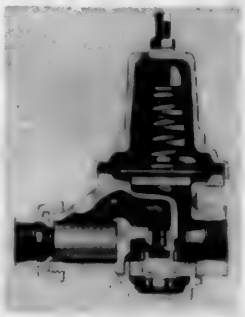
Called the Thrifty, the heater is fired with ordinary fuel oil but will burn gasoline when outdoor temperatures fall below the firing range of fuel oils. Its heating capacity is manually controllable from 50,000 to 170,000 Btu per hr. Heated air is discharged under pressure by an electric-motor-driven blower. The heater may be used indoors or out, and canvas ducts can be used to spot heat where desired. Combustion gases can be separately vented to the outdoors whenever safe practice requires that precaution.

With the addition of the new heater, the company's line of portable air heaters now includes three different models. The Utility model offers interchangeable power plants and can be converted from gasoline engine to electric motor drive in a matter of minutes. Its capacity is 70,000 to 425,000 Btu per hr. The oil-fired, electric-motor-driven De Luxe model has a capacity of 280,000 to 450,000 Btu per hr and is automatic in operation.

More information? Circle Item 4 on postcard, page 124.

Regulator Has Union End

Water pressure regulators and relief valves with an attached union end and a Monel strainer are announced by Wilkins Co., Los Angeles, Calif. Present available sizes are ¾ and 1 in., and a production set-up for ½, 1¼, 1½ and 2-in. sizes is almost completed.



Among the features of the regulators are a slip-on yoke that allows seat and disc replacement in 60 seconds, brass construction, and a reinforced diaphram which automatically reduces varying high pressures.

The attached union end saves the cost of an extra union and permits the regulators to be installed in close quarters.

More information? Circle Item 5 on postcard, page 124.

Fitting Is Self-Flaring

A self-flaring fitting for standard size tubing from ⅛ to 2 in. OD is offered by Flodar Corp., Cleveland, Ohio. With adequate tube strength, the fitting will hold pressures in the order of 20,000 psi or more.

Catalog BA 555 gives instructions for properly assembling the fitting and illustrates the method by which the fitting flares tubing.

More information? Circle Item 6 on postcard, page 124.

Heating-Cooling Conditioner

A heating-cooling conditioner is introduced by Warren Webster & Co., Camden, N. J. The unit is contained in a cabinet 14 in. wide, 20 in. high, and 6¾ in. deep and fits within a standard stud of 16 in. centers. Three enclosure arrangements permit a choice of recessed, semi-recessed, or free-standing cabinet installations.

Each unit consists of a coil for the flow of cool or warm water, a filter, a 3-speed fan, and a suitable drip connection. A spring-hinged door swings down to provide access to the fan switch, which permits a selection of low, medium, or high fan speeds. This also provides access to a thumb screw which permits removal of the entire front for replacement of the filter or for any maintenance operation.

Motor and fan are rubber-mounted. The coil is made of aluminum fins on copper tubing, utilizing the same design fundamentals which have been incorporated in the company's baseboard heating and other fin surface elements. Double directional louvers are provided to spread warm or cooled air throughout the room, without resorting to high velocities. In rooms such as the kitchen or bathroom, where no summer cooling is desired, baseboard heating or wall convectors are used.

The basement installation utilizes a chiller and a boiler connected in parallel and fitted with shutoff valves for seasonal changeover. Both air-cooled and water-cooled chillers and a water tower are available from the company.

While the heating-cooling conditioner is currently offered in only one size, an additional size is in preparation. It is also expected that another type of cooling system will be added later.

The heating-cooling conditioners are described in an illustrated 8-page bulletin, B-2001, containing dimensions, heating and cooling capacities, control arrangements, and specifications.

More information? Circle Item 7 on postcard, page 124.

Drawn Oval Capacitors

Drawn, oval capacitors are being made for air conditioning, refrigeration, fan motors, and similar applications by The Potter Co., No. Chicago, Ill.

Available for 236, 330, and 440v a-c, 60 cycles, all sizes of the capacitors are made in seamless cases. The tops being joined to the cases by a double-rolled seam. No solder is needed or used in the case. The cases are filled with chlorinated diphenol resin, which is non-flammable and has high dielectric qualities.

The capacitors are made with three types of terminals to fit specific needs, whether mechanically joined or soldered leads are preferred. The terminal types are a quick-connect type and eyelet and fork types. Each are available for conventional or barrier-type terminal mounting.

Two types of mounting brackets are offered on the capacitors: Type A, footed; and Type B, wrap around.

More information? Circle Item 8 on postcard, page 124.

Condensation Return Units

Condensation return units, known as Type PTC Redi-return, are manufactured by American-Marsh Pumps, Inc., Battle Creek, Mich., for school, office, and apartment heating systems.

Floatless electrode controls with stainless steel rods and tips operate the pump through water contact. The units have a lubricated motor, a bronze impeller, mechanical seals and a 16-gal tank. The tank has a low return inlet.

Various sizes of the units handle from less than 5000 sq ft EDR at 20 lb discharge pressure to 18,000 sq ft at 20 lb and 9000 sq ft at 30 lb. Single and duplex units are made with single- or 3-phase motors.

Specifications of the units are contained in Bulletin 429-7.

More information? Circle Item 9 on postcard, page 124.

Unit Heater Uses Blowers

A line of blower-type unit heaters is introduced by C. A. Dunham Co., Chicago, Ill. The new line has a wider range of capacities and applications than the blower-type unit heaters previously manufactured by the company.

Available in 170 ratings from 125,000 to 1,500,000 Btu per hr and from 1,430 to 28,800 cfm, the units can be mounted on the floor, wall, or ceiling. They can be used with or without ducts, with a bypass damper, filter section, and mixing dampers to handle a variety of space or process heating and ventilating requirements.

More information? Circle Item 10 on postcard, page 124.

Cast Steel Steam Trap

A cast steel steam trap, Model 7CS, for pressures to 400 psi and temperatures to 500 deg has been developed by The Clark Mfg. Co., Cleveland, Ohio.

An inverted bucket type, the steam trap is designed for removing condensate from high pressure steam lines. Inverted bucket type traps are not subject to damage by start up surges or impact from water hammer.

The trap is available with ½ or ¾-in. vertical connections and is equipped with the company's Duo-Step leverage for maximum capacity.

More information? Circle Item 11 on postcard, page 124.

Horizontal Room Cooler

A horizontal room conditioner, called the Remotaire, for year-round heating and cooling is announced by Plumbing and Heating Div., American Radiator & Standard Sanitary Corp., Pittsburgh, Pa. The unit is suitable for installation in hotel or motel rooms, offices, retail stores and homes, where it usually can be located in wasted or unused overhead space.

The air conditioner is available in three models and four capacities, namely, 200, 300, 400, and 600 cfm. Model H, the basic unit, is intended primarily for new construction applications where it can be built into specially-designed overhead enclosures. Other models consist of the basic unit with the addition of a housing, incorporating the filter and inlet grille, which encloses the fan and motor assembly. Model HR has the filter and inlet grille located at the rear of the housing; Model HB has it on the bottom.

The three models make it possible to select a unit for various installations, either exposed, or concealed in an attic, closet, dropped ceiling, or other furred space.

Each unit is connected by a supply and return water piping system to a separate central heating-cooling plant. Room air is drawn into the units by fans, filtered, then passed through four rows of tinned copper tubes with aluminum fins before being recirculated back through the room. In summer, chilled water circulating through the coil, chills and dehumidifies the filtered air. In winter, the process is reversed; heated water in the coils warms the filtered air to the point necessary to maintain comfortable room temperatures. Moisture from humid summer air is collected in a condensate pan and piped to the nearest drain outlet.

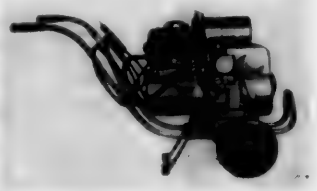
All models of the air conditioner are equipped with 3-speed fan control switches in a control box designed for flush wall mounting. Other control packages are available at slight additional cost to meet local climatic conditions and to facilitate control installations in the field. Factory-assembled and inspected, the control assemblies are connected to the wall thermostat and junction box. Optional control items available in various combinations include: a line voltage thermostat for on-off fan control, a key-operated summer-winter switch, and an automatic on-off solenoid control of the water flow through the coil. For reduction of maintenance costs on large multi-unit installations, a special control package is also available to provide automatic switch-over from summer to winter operation.

Each unit is equipped with a fiber glass filter and a full-length drain pan. The coils are designed for right- or left-hand installation and may be reversed on the job. Field installations require connections outside the unit enclosure only.

More information? Circle Item 12 on postcard, page 124.

A-C Welding Set Is Portable

A portable generator-welder combination, weighing 250 lb, is announced by Royal Arc Industries, Inc., Chillicothe, Ill.



Designed as a portable source of a-c power, the unit combines an air-cooled Onan 205AJ-1M, 2500-watt, 115-v, 60-cycle, a-c electric generating plant with a Royal Arc Model 150AJ transformer-type welder into a generator-welder package for construction and building jobs, repair shops, farms, ranches, service stations, municipal departments, and railroads.

Together, the generator-welder combination provides electric power on-the-spot for welding, operating hand tools, or floodlighting a work area.

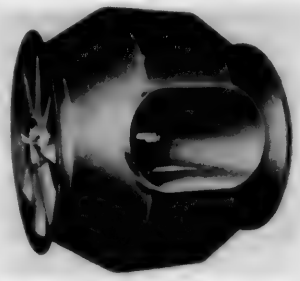
As separate units, the generator or welder may be operated independently of the other. Disconnect the welder and the generator becomes a portable a-c power plant. Lift the welder free from the assembly and it can be plugged into any 110 or 220-v, single-phase, a-c current source for repair and maintenance work.

As a portable source of 60-cycle current, the combination is suitable for emergency use when commercial power is interrupted. It is available mounted on a lightweight, two-wheel dolly or a welded tubular steel carrying frame.

More information? Circle Item 13 on postcard, page 124.

Fumes Bypass Fan Motor

A duct fan called Bi-Pass is being made by Hartzell Propeller Fan Co., Piqua, Ohio. Direct-connected with the motor mounted in a tunnel out of the air stream, the fan is designed for high temperature jobs such as ovens, oil- and gas-fired, induced-draft boilers, and for moving corrosive fumes.



The fan is available in two classes of construction. Model HN (standard construction) will operate satisfactorily to 300 deg F, provided the motor tunnel is in ambient temperatures not over 95 deg. This unit uses an open-end motor in an uninsulated chamber and an aluminum propeller.

Model HXN (high temperature, heavy-duty construction) has a motor chamber insulated with 1-in. of glass wool and a layer of aluminum foil. The temperature limit on this model with an aluminum propeller is 450 deg. With a heat slinger added and a Monel or stainless steel propeller substituted, the maximum temperature can be extended to 550 deg.

The fan is available in 25, 27 and 37-in. diameters. Corrosion-resistant materials and coatings are also available if the fan is used to move fumes containing acids or alkalies.

More information? Circle Item 14 on postcard, page 124.

Plastic Cable Clamp

A one-piece plastic clamp for holding wires, cable, and tubes is introduced by Shakeproof Div., Illinois Tool Works, Chicago, Ill.

Replacing an aluminum clip that is necessarily covered with insulation material, the Nylon fastener is non-chafing, non-corrosive, and self-insulating. The plastic cable clamp is lighter than aluminum and withstands a wide temperature range. In addition, the curved-base design and snap-in feature provide a tight hold and prevent rattling.

A variety of wire and tube sizes plus a range of panel thicknesses can be accommodated by the fastener.

Additional information and samples of the clamp are available.

More information? Circle Item 15 on postcard, page 124.

Flat-Type Welding Ring

A flat-type welding ring with ⅛-in. diameter spacer pins is introduced by Tube Turns, Louisville, Ky., a division of National Cylinder Gas Co. It was developed to improve the submerged arc welding of pipe and fittings but is also suitable for many manual welding applications. The ring enable joints to pass X-ray and gamma ray inspection and to meet safety code requirements. It is recommended where the special features of the Tube-Turn groove-type welding ring are not needed.

The small spacer pins of the flat-type welding ring automatically center it in the joint. Projecting as they do beyond the pipe's outer diameter, the pins prevent the ring from shifting up or down stream in vertical or steeply sloping lines. This makes the job of tacking the ring to the pipe's inner diameter unnecessary, to prevent it from shifting before or during welding.

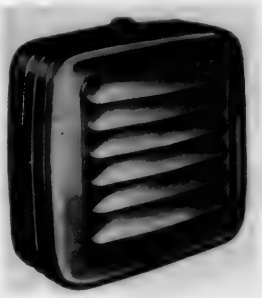
After the pipe ends are properly tacked together the spacer pins are knocked off with a sharp blow of a chipping hammer. No projections between the pipe ends remain to impede the welder in depositing the root bead.

The two spacer pins near the gap can be grasped as levers to compress the ring for easy insertion. This is helpful when using the comparatively stiff 4-in. and smaller sizes. The same two pins prevent the ring from twisting into a helix before tack welding is completed. The new ring is also helpful in aligning piping assemblies preparatory to tacking.

More information? Circle Item 16 on postcard, page 124.

Heaters for Corrosive Systems

A line of unit heaters for applications where internal corrosion problems are particularly severe is announced by Modine Mfg. Co., Heating and Air Conditioning Div., Racine, Wis.



Designated HCR, the heaters are intended to reduce maintenance and replacement costs in plants where conventional unit heaters and steam specialties must be replaced frequently because of adverse operating conditions. Examples of such conditions include installations where large volumes of high pressure steam are used in process work and where a considerable amount of make-up water with its acid and corroding agents is introduced into the system. Severe corrosion tendencies may also be present in certain low pressure steam systems lacking effective de-aerating equipment or provision for adequate boiler water treatment.

The condensers are coated with a baked finish that is resistant to salt air, humidity, and mildly acidic or alkaline atmospheres. The casings are treated and sprayed with the same protective finish that coats the condenser.

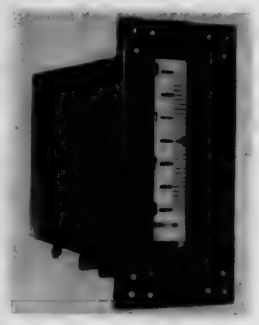
The units weigh no more than standard unit heaters having the same capacities. No special ceiling supports or reinforcements are required for their installation.

For replacement of standard units whose condensers have failed, units are available without motors if desired. The capacities of twelve horizontal delivery units (illustrated) range from 43,000 to 280,800 Btu per hr. Sixteen vertical delivery types have capacities of 140,300 to 609,600 Btu per hr, and ten horizontal delivery, draw-through type units have 195,700 to 609,600 Btu per hr capacities.

More information? Circle Item 17 on postcard, page 124.

Smaller Size Draft Gages

Straight line, pointer draft gages, the dimensions of which are close to half the size of the company's gages, have been designed by Ellison Draft Gage Co., Inc., Chicago, Ill.



Designated Minified, the gages are designed to measure pressure, vacuum, or differential pressures. Receiver-type gages for use with pneumatic transmitters are also being made in the smaller size. The gages are for use on compact console, graphic, or other panels where space is limited.

The smaller gages have all the features of the standard size gage, namely, non-parallax pointers, 5-in. translucent glass scales with draft designations, internal illumination, and removable individual elements.

Bulletin No. 214 contains further information.

More information? Circle Item 18 on postcard, page 124.

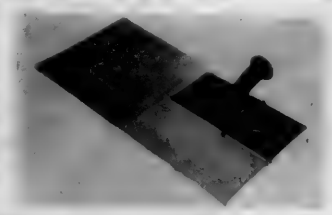
Foam Insulating Material

A synthetic cellular material called Allfoam is announced by American Collo Corp., Ridgefield, N. J. Though it is used for a variety of purposes, the material can be employed in the building industry as an insulation. It has a *k* factor of 0.27 in addition to sound-absorbing properties.

More information? Circle Item 19 on postcard, page 124.

Diffuser Reduces Air Velocity

A competitively-priced air diffuser for air conditioning and temperature control in industrial and commercial structures is announced by Multi-Vent Div., Pyle-National Co., Chicago, Ill. The diffuser is not restricted to air cooling; it can also be used in heating and ventilating systems.



Called Modular, the diffuser is a standardized, smaller version of the patented Multi-Vent units used in railroad cars and in critical locations such as hospitals and laboratories, where temperature control and low velocity air movement are important.

The diffuser (shown as it would appear from above an acoustical ceiling) employs a perforated ceiling panel to introduce air vertically, and at low velocity, into a room or working area. The perforations reduce the high velocity of air in the duct from 1000 to 1500 fpm to 40 or 50 fpm as it leaves the panel. An analogy to the system is the principle of the sprinkling can. A perforated head or a direct spout each deliver the same amount of water, but the flow from the perforated head is much more gentle and widespread.

Suitable for ceilings with various combinations of acoustical treatment, illumination, fireproofing, and radiant heating and cooling, the air diffuser can be completely concealed from view. It offers no interference to light fixtures and permits freedom of partition movement, such as office walls or shelves. Walls or partitions can be moved adjacent to or bisecting a panel without disturbing the effective air distribution.

Dirt marks and smudges are avoided because air leaving the diffuser moves vertically, away from the ceiling, rather than horizontally, preventing dirt impingement on these areas. There is nothing visible to mar decorative schemes.

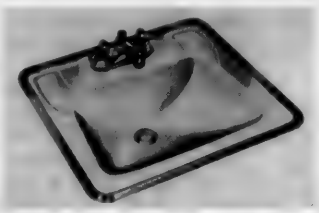
The panels are available for the most types of ceilings —metal pan, plaster, and acoustic tile—as well as for exposed duct applications. Eight of the units would be required in a room measuring 25 x 25 x 12 ft, having an average heat load.

Complete details of the company's entire air diffuser line are described in illustrated literature available from the firm.

More information? Circle Item 20 on postcard, page 124.

Cast Iron Lavatory

A porcelain enameled, cast iron lavatory for building into cabinets and counters is announced by The Humphryes Mfg. Co., Mansfield, Ohio.



Available for immediate shipment in white and five pastel colors, the lavatory is 20 x 18 in. in size and has a 16 x 11¾-in. tapered basin. It is equipped with two recessed, integral soap dishes and is installed by using the company's stainless steel mounting rim.

The unit is known as Model 3500 for 8-in. spread fittings and as Model 3505 (illustrated) for 4-in. centerset fittings. Both are companion units to the company's No. 7820, a 21 x 17-in. vitreous china model which is also made in white and five colors.

A catalog and price information are published by the manufacturer.

More information? Circle Item 21 on postcard, page 124.

Fan Is Reversible

A double ring, reversible fan is added to the line of industrial ventilating equipment manufactured by Hartzell Propeller Fan Co., Piqua, Ohio.

The new model is designed for ventilating jobs requiring intake during some periods and exhaust during others. It consists of an aluminum alloy reversible propeller and two curved orifices welded face to face.

The fan is available in direct connected, belt drive, pulley drive, and extension shaft models. Each model is available in 28, 36, and 44-in. diameters.

More information? Circle Item 22 on postcard, page 124.

Room Cooler Sits on Floor

A room air conditioner which is installed neither in the window nor in the wall is announced by Carrier Corp., Syracuse, N. Y.

Called the Roomette, the air conditioner sits on the floor instead of a window-sill and need not be located anywhere near a window. It measures 27 in. high, 15 in. wide, and 28 in. deep and has a flat top so that it can double as an end table or lamp table alongside a davenport or chair. All controls and the grilles for the movement of conditioned air are located on the front panel.

Developed originally for use in mobile homes, the device can be applied to almost any room in an ordinary residence. The basic difference from an engineering standpoint between the new unit and standard models, is that the air for refrigerant condensing is drawn through the bottom instead of the back of the unit.

For first floor locations in a house built over a crawl space or with a well-ventilated basement, a 13 by 15-in. hole is cut in the floor to fit the opening at the bottom of the unit. The air conditioner is then set over the hole and provided with electric power.

In second floor and other installations where direct condensing into unused space below is not possible, a short duct can be run from the bottom of the unit through the exterior wall. This might be fitted between the floor joists, or it could be made in the form of a small platform on which the unit would be placed.

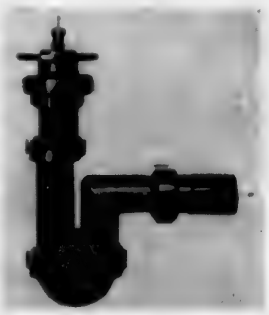
The air conditioner is currently manufactured in a ¾-hp model that is designed for use with standard 115-v household circuits. Its modern styled cabinet is available in a driftwood beige color.

All units are equipped with thermostats and filters. They cool and dehumidify, clean, and circulate the air.

More information? Circle Item 23 on postcard, page 124.

Plastic P-Type Sink Trap

A new model polyethylene sink trap is introduced by Arthur S. LaPine & Co., Chicago, Ill. In comparison with the earlier S-type sink traps, which had interior junctions not visible from the outside, the new P-type trap is like ordinary metal traps in that one surface of all pipes can be seen from the exterior.



If a hidden part of the outflow pipe from the sink were to be damaged in any way on the earlier S-type model, there was the possibility of sewer gases or refuse bypassing the trap. The new P model provides a positive seal at all times. It retains all the advantages of the earlier polyethylene sink trap. It is resistant to acids, alkalies, mercury, and other chemicals. The trap can be installed without tools and dismantled by hand when it is to be cleaned.

The basic parts of the trap are the same: an outflow pipe with a lock nut, a trap, and an outlet union. A strainer and stopper and an interchangeable high level drain are also furnished with each trap.

The P-type trap can be connected to drain lines because the 1½-in. NPS pipe on the outlet union will accommodate insert adapters for connection to standard, American-size polyethylene pipe.

A cup-type lock nut on the new model enables its use on metal sinks as thin as 16 gage (0.063 in.) or on stone or ceramic sinks as thick as 1⅞ in. It is no longer necessary to have a special outflow pipe threaded up to its flange for use with metal sinks.

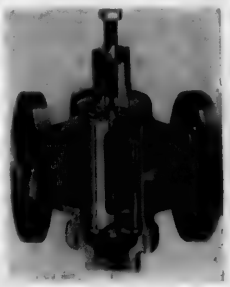
Another design improvement is the inclusion of a union nut on the trap for connection to the outflow pipe. When the trap is being installed, only the union nut need be turned, not the entire trap, so that the drain pipe connection is not disturbed.

More information? Circle Item 24 on postcard, page 124.

Plug Valve Is Lubricated

A lubricated plug valve for working pressures of 200 psi for oil, water, or gas and 150 psi for steam is manufactured by Homestead Valve Mfg. Co., Coraopolis, Pa.

A ring of lubricant, which appears between the stem and the body of the valve, shows when the lubricant system is full. This prevents lubricant from being fed into the line fluid.



An indicator on top of the stem shows the position of the ports in the plug. The plug is self-freeing.

Cast in a variety of metals and alloys, the valve is available in straight-way, 3-way, 4-way, and multiple-port types, with either 100% pipe area or Venturi ports for restricted flow.

A 28-page catalog, No. 39-5, describes the company's entire line of lubricated plug valves.

More information? Circle Item 25 on postcard, page 124.

Masonry Cutting Blades

A line of masonry blades called the Niagara line is announced by The Carborundum Co., Niagara Falls, N. Y.

The line provides contracting and building trades and industrial users blades that will cut brick, concrete products, stone, tile and non-metallic pipe, as well as asbestos, cement, gypsum, Transite, Masonite, and Celotex.

The blades are selected for cutting operations by their numerical coding system. Yellow blotters identify wet cutting blades manufactured of silicon carbide with a waterproof resinoid bond. Blue blotters identify dry cutting blades of resinoid bonded silicon carbide.

Blades marked with a green blotter are new Carboflex glass fiber reinforced cutoff wheels. The wheels are reinforced for safety. Their knurled sides permit a free cutting action without side binding.

More information? Circle Item 26 on postcard, page 124.

Shear Is Operated by Hand

A hand-operated shear for cutting up to 2 by ¼-in. flat or ⅜-in. round steel bar and No. 10 SWG sheet steel is introduced by John Ould, Ltd., Mount Vernon, N. Y.

Called the Hilshear, the tool, develops a cutting force by means of a power gearing system with an adjustable pinion to facilitate the cutting of various sizes and thicknesses of stock. During cutting, the cutting point is always visible.

In many operations, the shear can be used instead of a hacksaw, thereby eliminating the filing and grinding normally required after cutting with a hacksaw. For example, the shear can be used to cut a narrow strip from bar up to 1 by ⅛ in. or to remove as little as a 1/32-in. strip from sheet metal. The shear will also cut a miter in angle iron, and will cut bevels, flats, and curves.

The body of the shear is made of drop-forged steel. The Sheffield steel blades will last up to ten years with normal usage, but can be replaced in the event of damage.

More information? Circle Item 27 on postcard, page 124.

Refrigerant Distributor

A Venturi-type refrigerant distributor, designed to solve a number of problems connected with multi-circuit evaporators, is introduced by Alco Valve Co., St. Louis, Mo.

Called the Venturi-Flo, the distributor is a control device which assures equal flow of refrigerant to all passes of multi-circuit systems. It is designed to work equally well in vertical or horizontal positions.

Made of one-piece, it does not use nozzles for capacity regulation. The distributor is engineered for an application range from 25% of capacity to 150% of rated capacity, with a small pressure drop at maximum conditions. The low pressure drop makes it easier to choose thermally-operated valves of the right capacity for multi-circuit installations.

Further information on the refrigerant distributor is contained in Catalog Section 188-55.

More information? Circle Item 28 on postcard, page 124.

Manufacturers' Representative

If you are seeking new lines, we suggest you register your name, territory covered, and present lines with this publication. We get numerous requests from manufacturers seeking representatives and by registering you pave the way to lining up desirable accounts. Write to the Editor, AIR CONDITIONING, HEATING AND VENTILATING, 93 Worth St., New York 13, N. Y.

Exchanger Door Opens Readily

A self-seating door that reduces the time to open heat exchangers, autoclaves, sterilizers, and other pressure vessels has been developed by The Patterson-Kelley Co., Inc., East Stroudsburg, Pa.

Taking about five seconds to open, the door, called Lever-Lock, is locked and unlocked by means of bars. Standard exchanger doors are normally bolted closed, and require an hour or more to take off and put on.

The door is particularly suited for use on heat exchangers that carry high-fouling liquids and require frequent entry for cleaning and inspection. Capable of withstanding temperatures from −70 to 400 deg F, and pressures ranging from full vacuum to 300 psi, it has also been used on autoclaves and sterilizers in the textile, chemical, food processing, and rubber manufacturing industries.

The bars on the door are inserted into and withdrawn from fittings in the vessel by a hand-operated lever. This lever, located at the center of the door, opens with a turn of 60 deg and about a fifteen-pound pull. The door can be swung open manually or by means of a pneumatic cylinder.

The door has a tight-fitting closing gasket and automatically seats itself when closed. A mechanical lock safety device prevents the door from being opened while the vessel is under pressure. The door may be used on either horizontal or vertical installations; in vertical operation, a pneumatic lifting mechanism is required, since large models of the door weigh in the neighborhood of 300 lb.

More information? Circle Item 29 on postcard, page 124.

Rotary Machine Has 12 Rolls

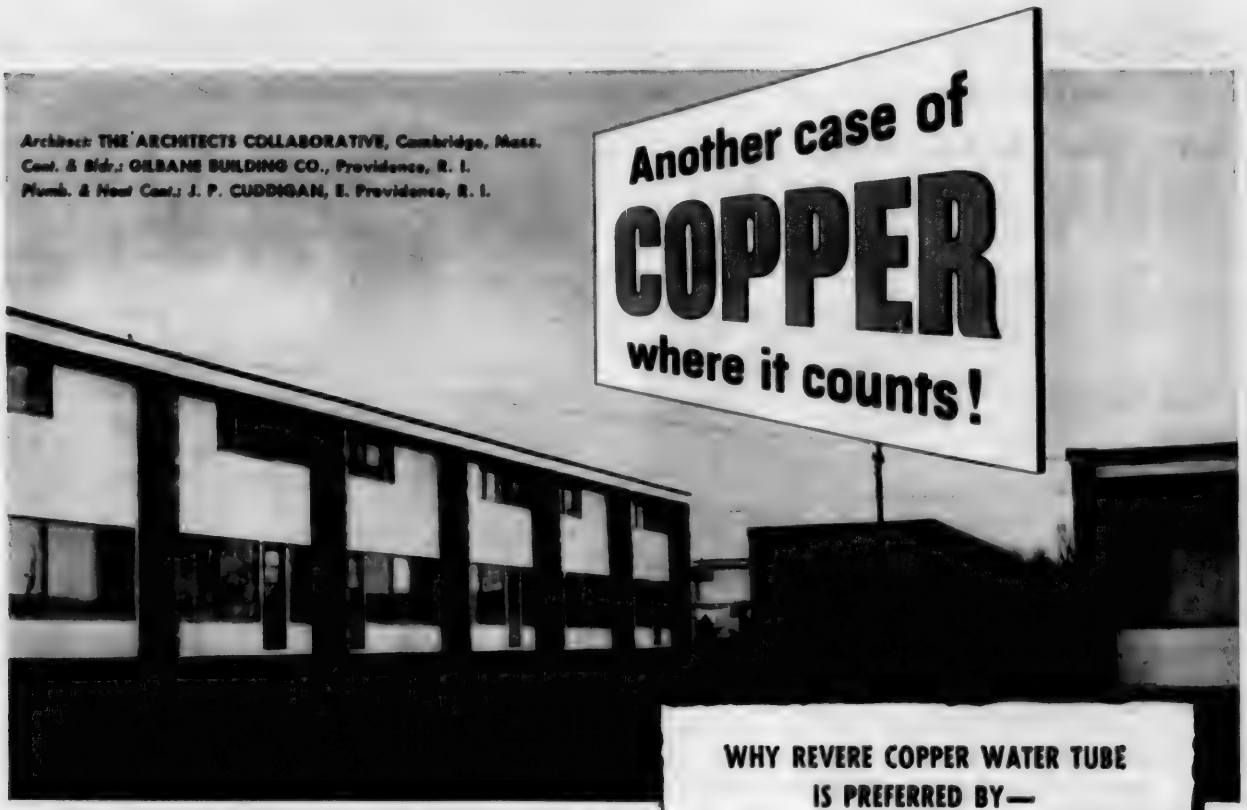
A hand operated, deep throat, Combination Machine, No. 150, is added to the line of power and hand operated rotary machines made by Niagara Machine & Tool Works, Buffalo, N. Y.

Equipped with 12 different pairs of standard rolls, the machine can perform a variety of jobs: turning, burring, wiring, elbow edging (3 types), single beading, OG beading, crimping, furnace collar edging, body flanging, slitting, and trimming.

Featuring deep throat construction and longer shaft ends for wider rolls, the machine is suitable for a number of operations that cannot be performed on throatless machines. For convenience, work can be fed in either direction with the same clockwise cranking.

More information? Circle Item 30 on postcard, page 124.

(*Continued on page* 118)



Architect: THE ARCHITECTS COLLABORATIVE, Cambridge, Mass.
Gen. & Bldr.: GILBANE BUILDING CO., Providence, R. I.
Plumb. & Heat Cont.: J. P. CUDDIGAN, E. Providence, R. I.

QUONSET POINT HOUSING DEVELOPMENT

(HOSKINS PARK) Davisville, R. I.

200,000 FT. OF REVERE COPPER WATER TUBE USED IN 350 UNITS

This low-cost apartment house project of 64 buildings is new testimony to add to the proof of the economy of using Revere Copper Water Tube for plumbing and heating lines. If you have ever had any doubts as to the relative costs of using copper in your work, this job should dispel them forever.

For on a project such as this, costs are checked and rechecked. And, when, after a close scrutiny of costs, 200,000 ft. of Revere Copper Water Tube was selected for the plumbing and heating lines you can bet your bottom dollar it was because it was the economical material to install.

Further proof of the economy of using enduring Revere Copper Water Tube is shown in the panel at the right. Check these reasons, point for point, and you can readily see why it makes good sense to use Revere Copper Water Tube for radiant panel heating, plumbing and heating lines, underground service lines, processing lines, waste stack and vent lines. See your Revere Distributor for your needs. And if you have technical problems involving the use of Revere Copper Water Tube, one of our Technical Advisors will be glad to help.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

Mills: Baltimore, Md.; Brooklyn, N. Y.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Newport, Ark.; Rome, N. Y.
Sales Offices in Principal Cities, Distributors Everywhere

WHY REVERE COPPER WATER TUBE IS PREFERRED BY—

Architects, Builders, Plumbing & Heating Contractors

EASY TO BEND

Saves Time

Revere Copper Water Tube is easy to bend. Soft temper can be bent by hand to meet installation conditions.

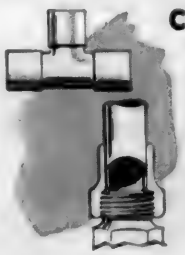
HANDY LENGTHS

Save Fittings . . . Labor

Revere Copper Water Tube comes in straight lengths of 20' in hard and soft tempers. 60' coils of soft temper reduce the number of fittings needed.

SOLDER OR COMPRESSION FITTINGS

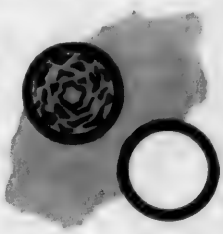
Need Less Work Room . . . Save Metal



No worry about wrench room when you use Revere Copper Water Tube with solder fittings. Compression fittings can also be used. No threading is necessary with either type fitting. Wall thickness of tube used can thus be less than for threaded pipe.

NON-RUSTING

Rustable pipe eventually clogs as shown in drawing at top right. Non-rustable Revere Copper Water Tube suffers no loss of flow or pressure as shown at bottom right. No allowance in pipe size need be made for rust accumulation with Revere Copper Water Tube.



(*Continued from page* 116)

Spray Head Is Adaptable

A spray head that is adaptable for the spray distribution of low pressure fluids from discharge pipes is introduced by N. C. Stearns Co., Shreveport, La. The device is for use in industrial cooling towers, air conditioning cooling towers, spray ponds, and similar installations.

Providing a pattern of wetting from the center out, the spray head produces a controlled spray of evenly divided fluid particles at pressures under 5 psi. In cooling towers, the pattern will cover the width of a standard horizontal cooling section without water loss. On vertical coils, maximum efficiency is obtained by using dual baffle boards. The spray head allows free air circulation around tubes and eliminates blanketing and dampening effects.

Attached to a 1-in. discharge pipe, the spray head offers little resistance to the flow of water, and the shape of its revolving rotor minimizes the tendency of foreign matter to hold on to its surface.

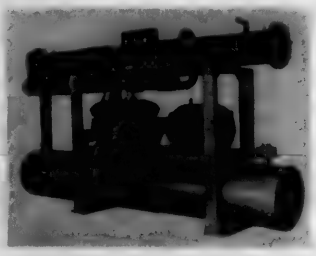
All metal parts of the spray head are made of electropolished, stainless steel. The rotor is made of inert, resilient Nylon and is not affected by the chemical action of the inhibiting additives used in industrial cooling water.

The permissible ambient temperature range of the spray head is from 50 deg below zero to 250 deg F.

More information? Circle Item 31 on postcard, page 124.

Water Coolers from 5 to 125 HP

A line of packaged water cooling machines, designed for air conditioning and process refrigeration installations ranging in size from 5 to 125 hp, is announced by Carrier Corp., Syracuse, N. Y. All 12 different machines in the line are engineered, assembled, and tested at the factory prior to shipment.



Models are available from 25 to 75 hp for handling the varied applications for chilled water under 100 tons capacity. Suitable for installations where space is critical, the units will pass through an average-size doorway.

All components of the refrigerating system—compressor, condenser, and cooler—come as a single unit that is piped and is filled with oil and a holding charge of refrigerant. Mounted in a structural steel frame, the units can be installed, after placing the equipment in position, by making the water and electrical connections.

Minimum space occupancy has been accomplished in the smaller models by assembling the compressor, cooler and condenser in a vertical plane, one component above the other. Larger capacity units resemble the side-type of assembly peculiar to centrifugal machines.

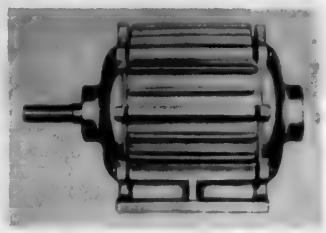
The heart of the packaged refrigeration systems is the company's reciprocating compressor which is constructed of replaceable components. Built for heavy-duty operation, they are available with the company's automatic capacity control which unloads the cylinders for matching the compressor operation to cooling requirements. This automatic unloading feature at start-up eleminates the need for more expensive motors.

Small water chillers from 5 to 20 hp come equipped with hermetic compressors that are entirely enclosed, and have no shaft seal. These units are completely charged with refrigerant.

More information? Circle Item 32 on postcard, page 124.

Motors Designed for Fans

A line of totally enclosed, fan-duty motors in ratings of ¾ to 20 hp has been designed for industrial and commercial use by The Lima Electric Motor Co., Lima, Ohio.



Built as standard, the series is designated as Type EFD. Its design features include double-width, prelubricated, sealed ball bearings. The motors have integrally cast fins to provide a heat dissipating surface and allow a smaller transverse section, which offers less restriction to air flow. The windings are made of polyvinyl-acetal insulated wire. Optional connection boxes are available with the motors to fit air-over-motor applications.

For installations requiring explosion proof construction, the motors are built in a Type EXFD which is approved by the Underwriters Laboratories for use in hazardous locations of volatile gases and explosive dusts.

Typical applications of this type of motor include: industrial and commercial fans, blowers, man coolers, cooling towers, air conditioners, unit heaters, and others where an air-over-motor unit is used.

More information? Circle Item 33 on postcard, page 124.

Safety Handle for Air Drill

A safety handle for paving breakers is announced by Ingersoll-Rand Co., Phillipsburg, N. J. It was developed as a result of field requests for a safety handle to be used on tools in connection with demolition work, where operators were injuring their hands when working close to walls or projecting masonry.

The safety device weighs less than 2 lb and is available on the company's PB8A paving breaker. It can also be purchased separately for attaching to existing PB8A models or earlier PB8's.

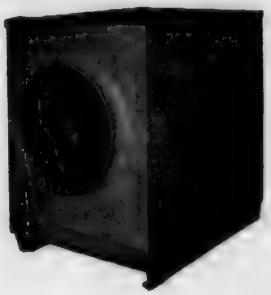
More information? Circle Item 34 on postcard, page 124.

(*Continued on page* 120)

Halstead & Mitchell

for LONG LIFE PROTECTION

COOLING TOWERS



with the exclusive

20-Year Guarantee!

on the wetted deck surface against rotting or fungus attack

YOU ARE GUARDED WHEN YOU CHOOSE A HALSTEAD & MITCHELL RESIDENTIAL OR COMMERCIAL TOWER

Only Halstead & Mitchell can offer a 20-Year Guarantee on the wetted deck surface against rotting or fungus attack because only Halstead & Mitchell creosotes cooling tower wood. No other material, subject to deteriorating or rusting, can be so guaranteed.

Stainless steel fans, sheet steel cabinets hydraulically painted with vinsynite, vinyl zinc and chlorinated rubber . . . add to this protection for the longest life. There's no extra cost for these extra protections . . . just extra long time benefits on the job.

2 thru 120 TONS

CONDENSERS

with economical

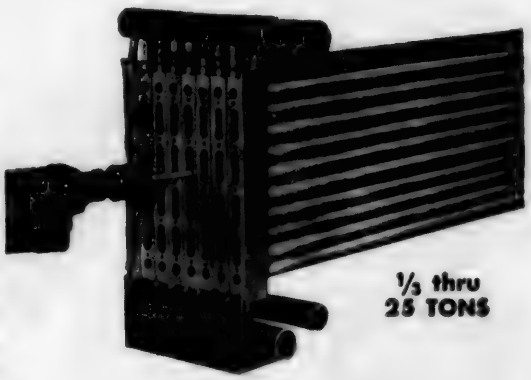
Lifetime Cleanability

for always-new efficiency

The cooling tower you select works with a condenser, and here again you are guarded by Halstead & Mitchell.

CLEANABILITY in a water-cooled condenser costs no more, but troubles from poor water conditions vanish. Heat transfer efficiency is maintained at new unit levels for life, for a simple mechanical cleaning tool restores heat transfer surfaces in minutes.

Regardless of whose condensing unit you buy, do what almost all leading manufacturers have done — specify CLEANABILITY. It's your most important protection . . . why settle for less?



⅓ thru 25 TONS

AT LEADING HEATING AND REFRIGERATION WHOLESALERS EVERYWHERE

Write for Detailed Specifications

HM Halstead & Mitchell

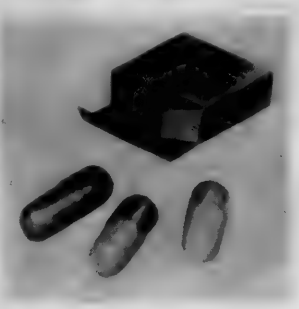
BESSEMER BUILDING • PITTSBURGH 22, PA.

(*Continued from page* 118)

Capsules Clean Boiler

A kit containing three capsules for cleaning steam and hot water boilers has been developed by Dominion Poly-Products Corp., New York, N. Y.

The kit is designed to clean rust, scale, and corrosion from the metal parts of a boiler. Because the chemicals are highly concentrated, it works in a relatively short time. The average time required to clean a boiler with the kit is a half-hour.



The manufacturer claims there is nothing in the chemical formulation that will injure any part of a boiler or the person making the application.

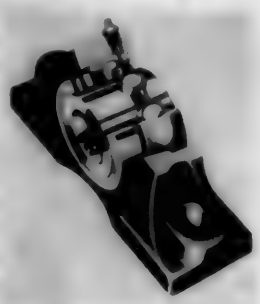
Each kit contains two yellow purge capsules and one white neutralizer capsule. It will clean a boiler with a capacity ranging from 16 to 100 gal of water and should be used once a year. There is nothing to measure, figure, or test as this is all done by the manufacturer.

Instructions and informative matter on the care of boilers is included in the kit. A tag is also included to be left by the service man for the consumer with educational and promotional material. It helps to educate the consumer in the importance of proper maintenance of the heating unit and serves to keep the name of the service man before him.

More information? Circle Item 35 on postcard, page 124.

Ball Bearing Pillow Blocks

A series of ball bearings designed for medium duty service conditions is being produced by Dodge Mfg. Corp., Mishawaka, Ind. Designated as SCM ball bearings, they contain all of the features of the company's SC ball bearings. In addition, the new bearings provide more load-carrying capacity and are available in larger shaft sizes. The series includes both ball bearing pillow blocks (illustrated) and ball bearing flange cartridge mounts.



The semi-steel outer housing of the pillow blocks provides greater strength with a streamlined appearance. Self-alignment is provided by the spherical outer race of the ball bearing inner unit, which fits into the spherical seat in the semi-steel housing.

Metallic-backed synthetic seals are mechanically anchored in position so that they will not blow under grease gun pressure. A locking pin prevents rotation of the outer bearing race while allowing for self-alignment. The bearing is locked to the shaft by two set screws through the collar at 120 deg.

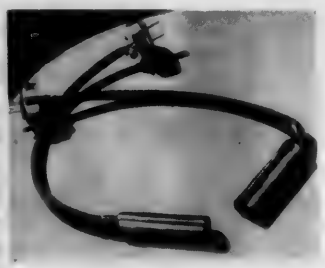
Assembled, factory-adjusted, and pre-lubricated, the ball bearings are ready to mount on the shaft. Both the pillow blocks and flange cartridge mounts are available from factory and distributors' stocks in popular transmission sizes.

Bulletin A-638 is a 52-page catalog of the company's several lines of ball and roller bearing pillow blocks.

More information? Circle Item 36 on postcard, page 124.

Conduit Protects Lead Wire

Mechanical protection for electric cartridge heater lead wires is provided by a flexible, brass conduit, lead wire enclosure available from Edwin L. Wiegand Co., Pittsburgh, Pa.



Marketed under the trade name Chromalox, the flexible brass conduit protects the entire length of lead wire by shielding it against abrasion, flexing stress, and moving parts and offers a safety factor where lead wires are normally exposed to the operator. Both the conduit and fittings are attached to the cartridge sheath and are unaffected by operating temperatures.

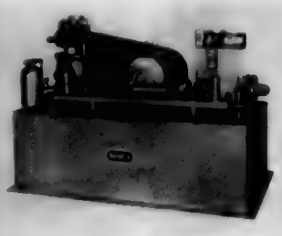
The flexible conduit is available on new electric cartridge heaters in a range of lengths and wattages for $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, and $\frac{3}{4}$-in. diameter heaters. It may be ordered with a straight connection to the heater or with a right angle fitting for use in confined spaces.

More information? Circle Item 37 on postcard, page 124.

Coolers for Process Fluids

Packaged units, designated CCP, for cooling process water and low viscosity liquids are introduced by Heat-X, Inc., Brewster, N. Y.

The ready-to-operate cooler packages have applications in the food processing industry, in bakeries, and bottling plants, where a large volume of water at low temperature is required.



Individual cast aluminum coolers, which make up the cooling systems, provide sufficient strength to protect the systems against freeze-up damage. The units are available with stainless steel circuits for sub-cooling Freons, cooling kerosene, light oils, or slightly corrosive foodstuffs.

The units are factory-tested before shipment, delivered completely wired, charged with Freon-12, and ready for operation. Their capacities cover the range from $\frac{1}{3}$ to 10 hp.

A descriptive catalog is available on request.

More information? Circle Item 38 on postcard, page 124.

(*Concluded on page* 122)

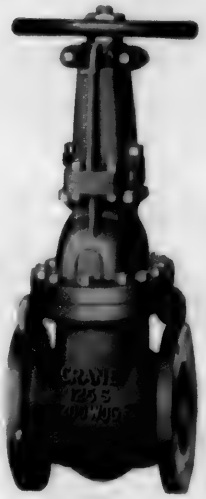
Testing...testing...50 years and longer to make CRANE VALVES maintenance free

Testing for product performance values is an old custom with Crane. It was started long before many standards existed—long before others in the field used this means of product improvement and quality control.

Today's Crane valve testing is done in both field and laboratory by the most scientific techniques. This continuing work seeks to increase valve performance and lessen maintenance needs. A single example is the stem packing test shown above.

Here's one of the reasons back of the thrifty buyers' preference for Crane valves. They can rely on ever-improving Crane quality to protect their company's investments in piping equipment—especially today, in the face of high maintenance and repair costs. No wonder industry keeps using more Crane valves than any other make.

Better Quality
Bigger Selection
in Valves
for Every Need



CRANE CO.

General Offices: 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

CRANE'S FIRST CENTURY . . . 1855-1955

(*Concluded from page* 120)

Generator Makes Gas

A generator for generating gas, for both home and industrial use, from ordinary white gasoline is being manufactured by Pressweld, Inc., Alliance, Ohio.

Called Prest-O-Gas, the generator produces a non-toxic vapor that is suitable for all purposes for which natural, manufactured, or bottled gas can be used. The generator leaves no deposits. It will produce enough vapor from 5 gal of gasoline to operate, under normal home use, a 4-burner gas cook stove, an oven, and a hot water heater for approximately a two-week period.

The gas produces a flame that permits a lower burner adjustment for economy in fuel consumption.

The generator can be used wherever electricity is available and operates only when gas is being used. It is designed to deliver the vapor at 3½ oz. pressure.

At present, the generator is being manufactured only in two domestic models, one with a 5-gal gasoline storage tank built in and the other with the tank separate for outside installation. Engineering is completed on larger models for heating and for both regular production and standby industrial service.

More information? Circle Item 39 on postcard, page 124.

Automatic Tank Indicator

A remote-reading, tank contents indicator, designed for applications where panel space is limited, is announced by The Liquidometer Corp., Long Island City, N. Y. The indicator is known as Model 216. A dial-type instrument, it has a scale length of 20 in., although occupying a panel space of 3 x 10¼ in. It is available for either horizontal or vertical panel mounting.

The indicator is used with automatic, hydraulically-actuated, tank contents gaging systems. The systems are approved by Underwriters Laboratories for gaging hazardous liquids. They are available for many corrosive as well as non-corrosive liquids and for tank pressures up to 200 psi.

The gaging system consists of an indicator and a float-type tank unit interconnected by a flexible conduit containing two hydraulic capillary tubes. The indicator may be located as far as 250 ft from the tank unit. A self-contained hydraulic system actuates the indicator; no outside power is required.

Where level control is required in conjunction with tank contents measurement, UL-approved switches are furnished. The tank unit is installed through a single 2-in. diameter opening in the tank.

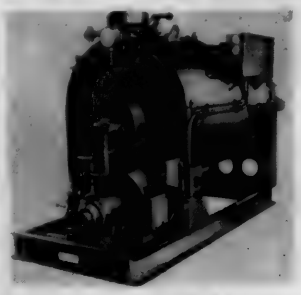
In addition to Model 216, a variety of other indicators can be used with the system. Also available are dial-type hydrostatic and direct-reading tank contents gaging systems for gaging virtually any liquid.

Further information concerning the indicator is contained in Bulletin 532.

More information? Circle Item 40 on postcard, page 124.

Steam Generator Is 3-Ft Wide

A 40-hp steam generator that is 83¼ in. long, 57¾ in. high, and 36½ in. wide at the skids has been designed by Cyclotherm Div., National-U.S. Radiator Corp., Oswego, N. Y. The package steam generator has safety devices to protect the boiler and maintain an efficiency of 80 per cent or better.



The unit delivers 1380 lb of steam per hr, and its heating output is 1,340,000 Btu per hr. Standard design pressures are available from 15 to 200 psi. The boiler burns oil, gas, or a combination of oil and gas.

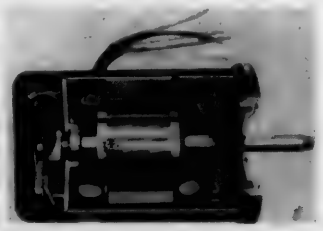
Automatic operation of the steam generator is controlled electronically. All controls are located in a single box, mounted at eye level on the boiler shell to facilitate maintenance.

Shipped from the factory pre-tested and ready to cut in on the line, the unit can be installed anywhere that fuel, water and electricity can be supplied to it. It requires no special foundation or stack.

More information? Circle Item 41 on postcard, page 124.

Motors for Jet Pumps

A line of fractional horsepower jet pump motors, which features a number of improvements, including a totally enclosed canopy housing that protects the vital parts from dirt, insects or rodents, is being produced by Electric Motor Div., A. O. Smith Corp., Tipp City, Ohio.



With the addition of vent slots to the main frame of the motor, the motors have a controlled ventilating system. The air-flow is aimed at the coils. The ball bearings are practically out of the air stream, with the result that contamination of bearings by air-borne grit is minimized.

In a functional grouping of components, the motor switch, starting capacitor, and automatic overload protector are all end-mounted and protected by the enclosed canopy. Mylar slot and phase insulation is used and is backed with rag paper for protection from punctures.

The units are available in single- and three-phase ⅓ to 2 hp and in models designed for either horizontal or vertical applications.

More information? Circle Item 42 on postcard, page 124.

PRODUCT INFORMATION SERVICE

Use the postage-free postcard below for further information on:

- **News of Equipment and Materials**

or a copy of the following

- **New Catalogs**

Circle the item Numbers in which you are interested and print clearly your name and address with title.

NEW CATALOGS

WATER CONTROLLER BULLETIN—A 4-page bulletin, BAM 2, on a thermostatic water controller is issued by the manufacturer, Lawler Automatic Controls, Inc., Mt. Vernon, N. Y. The bulletin lists the features of the controller's hydraulically formed Monel bellows hard chrome internal bearing surfaces, and the variable positions of the tempered water outlet. Also given are typical specifications and uses of the water controller in standard assemblies. .....Item 101

COMPRESSOR BULLETIN — A 14-page bulletin, No. 100-G, describes and illustrates the variety of types and sizes of refrigerating compressors manufactured by Frick Co., Waynesboro, Pa. Photographs illustrate the various applications of the compressors, and drawings and tables give their dimensions and specifications. .....Item 102

REVISED BOILER CATALOG—A revised and enlarged edition of its gold-embossed, leatherbound, loose-leaf catalog is available to the trade from Portmar Boiler Co., Brooklyn, N. Y. Featuring every size of water heater and heating boiler made by the company, the catalog gives specifications and trade prices for all sizes. It describes in detail the size and type of boiler needed to supply steam or hot water for a cottage or a housing project. The catalog is set-up to insert the new literature which the company sends out to the trade from time to time. .....Item 103

HOME INSULATING DESIGN BOOK—A 28-page booklet illustrating and describing home design principles for maximum heat control in summer and winter is published by Owens-Corning Fiberglas Corp., Toledo, Ohio. Entitled Insulation Design for the Air Conditioned Home, the publication, in two colors, includes 21 illustrations, 14 sketches and nine charts. It describes and illustrates Fiberglas products used for insulating the air-conditioned home, including the newly introduced foil-reinforced insulation. .....Item 104

CATALOG OF ROOF VENTILATORS — Aluminum roof ventilators: their dimensions, and performance data are described and listed in Catalog No. 55-B issued by Loren Cook Co., Berea, Ohio. Suggested mounting details and standard architect's specifications are also given. .....Item 105

HUMIDIFICATION CONTROL—A 16-page humidification control bulletin, No. 660, revealing some facts about losses caused by dry air during the heating season, is released by Armstrong Machine Works, Three Rivers, Mich. The bulletin begins with a detailed explanation of the effects of the relative humidity on profits, hygroscopic materials, health, dust, and static electricity. Tables included in the bulletin show recommended relative humidities to be maintained for processing and storage of various hygroscopic materials, regain of hygroscopic materials, and the effect of indoor heating on the per cent relative humidity. Also included in the bulletin are physical data, prices, and selection and installation information for steam humidifiers. .....Item 106

AIR CONDITIONING CATALOG—An 8½ x 11-inch, 20-page catalog, bulletin No. 817, describing a line of central-station, cabinet-type air conditioning units is available from American Blower Corp., Detroit, Mich. The catalog describes three types of air conditioning units for industrial and commercial applications. Ten pages of the catalog are devoted to tables and graphs that enable heating and ventilating engineers and contractors to determine the type of unit which will meet individual job requirements. .....Item 107

AUTOMATIC CONTROLS CATALOG — Automatic controls for domestic and industrial applications are the subject of a 64-page catalog, No. 700-B, published by The Mercoid Corp., Chicago, Ill. The catalog is divided into three major sections: one on controls for domestic heating applications; another on controls for industrial applications; and a third on magnetic and motorized valves. .....Item 108

VERTICAL MOTOR BULLETIN—A 12-page bulletin, GEA-6280, covering a new vertical motor called Tri-clad is announced by General Electric Co., Schenectady, N. Y. The bulletin describes, in color and photographs, the reduced maintenance costs and simplified lubrication of the motor. .....Item 109

PROMOTING STEEL PIPE—A 12-page brochure covering the promotional activities for steel pipe is published by Committee on Steel Pipe Research, American Iron and Steel Institute, New York, N. Y. An outline of the program is given in the brochure, and the various promotional activities are illustrated. .....Item 110

ROOF VENTILATOR CATALOG—Dimensions, specifications, and performance data on the line of power roof ventilators are available in Catalog A-112 released by Hartzell Propeller Fan Co., Piqua, Ohio. The 12-page illustrated catalog carries information and pictures on two new models, the Vertijet roof ventilator and a stack cap designed for duct exhaust systems. .....Item 111

PRESSURE-ENTHALPY CHARTS—Technical information which will give basic data for extended ranges of refrigerant pressure and temperature is being published in manual form by Kinetic Chemicals Div., E. I. du Pont de Nemours & Co., Wilmington, Del. Included in the new data are ten pressure-enthalpy charts, including one broad-range, a single-sheet refrigeration-range chart, and eight large-scale diagrams covering the refrigeration range; a single broad-range entropy-enthalpy diagram, and three graphs of specific heat data, broken down by constant pressure, constant volume, and the ratio of pressure to volume. .....Item 112

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MACHINERY MOUNTINGS CATALOG—A catalog, K2A, giving data on stopping vibration, shock, and noise transmission by using steel spring machinery mountings is published by The Korfund Co. Inc., Long Island City, N. Y. A series of eight typical case-histories, with installation photos, describes how Vibro-Isolators solved a representative range of vibration problems. Data tables giving capacities and characteristics of the isolators are furnished, including sizes, load capacities, and shipping weights. .....Item 115

WELD DEPOSIT DATA CARD—Engineers associated with the design and use of stainless tubular products in steam superheaters, header rolls, and high-temperature piping installations are offered a data card, TDC-178, by Tubular Products Div., The Babcock & Wilcox Co., Beaver Falls, Pa. The data card gives the stress rupture properties of chromium-nickel stainless steel weld deposits. .....Item 116

DRAFT CONTROL BROCHURE—A technical brochure covering the selection and specification of draft controls, in commercial and industrial sizes, for gas, oil, and coal fired heating equipment is issued by Field Control Division, Mendota, Ill. The literature enables an architect or engineer to write a detailed and accurate specification covering this component of a heating plant installation.....Item 118

BOOKLET ON SMOG PROTECTION—Protection from smog is a booklet published by Connor Engineering Corp., Danbury, Conn., that recommends an air distribution system, the removal of coarse particles and fine aerosols mists, and activated carbon filtration to eliminate gaseous and vaporous impurities from intake air to safeguard occupants of buildings from the hazards of smog. .....Item 119

VALVE CATALOG—A 4-page illustrated bulletin describing Monel and nickel corrosion-resistant valves is published by Alloy Steel Products Co., Inc., Linden, N. J. The bulletin discusses the corrosion-resistant properties of Monel and nickel, listing specific applications for which each is suited. Included in the bulletin are cross-sectional illustrations of gate, globe and check-type valves. .....Item 117

SHOWER EQUIPMENT FOLDER—A consumer folder that plumbing wholesalers and contractors can use as an envelope stuffer, mailing piece or showroom leaflet to increase interest in shower equipment is being distributed by Kohler Co., Kohler, Wis. Printed in black and blue, the 6 x 3½-in. folder describes the company's line of shower fittings with special emphasis on the Niedecken mixer, which enables the user to mix water to desired temperatures. Quantities of the leaflet are available for trade use. .....Item 118

PIPE APPLICATIONS—An L-M Permalite pipe bulletin, being distributed by Line Material Co., Milwaukee, Wis., provides information on the applications of bituminized fiber pipe. The 12-page bulletin, No. 54075, lists pipe sizes and furnishes information about shipping and handling methods. The company's facilities and processes for manufacturing the pipe are described briefly. .....Item 119

FIRE PROTECTION CATALOG—A 46-page catalog, No. 55, of interior fire protection equipment for all types of buildings is released by Elkhart Brass Mfg. Co., Inc., Elkhart, Ind. Line drawings and cross-indexing of cabinet specifications a accessories make the catalog a reference book for architects, engineers, and contractors. Fire hose, extinguisher cabinets, and other products are listed in the catalog. .....Item 120

HIGH PRESSURE VALVE BULLETIN—Information on the standard Type 148 high pressure reducing and regulating valve is contained in a bulletin published by the manufacturer, A. W. Cash Co., Decatur, Ill. Included in the bulletin are photographs and a cross-sectional engineering drawing, recommended uses, description of construction and operation features, capacity, rating and sizing charts, and other information. .....Item 121

SPEED CHANGERS ARE DESCRIBED—Speed changers, called Vari-Pitch, are described in a bulletin 2000D, released by Allis-Chalmers Mfg. Co., Milwaukee, Wis. The bulletin includes arrangement diagrams, a selection table showing recommended unit sizes for standard motors, and a speed range table of the speed changers. .....Item 122

SWIMMING POOL DATA BOOK—A 44-page data book and catalog, No. 105, of swimming pool supplies, chemicals, and equipment is published by Modern Swimming Pool Co., Inc., White Plains, N. Y. The catalog lists supplies and equipment for both new and existing pools. It contains reference data for contractors, architects, and engineers. .....Item 123

BOOKLET ON CORROSION CONTROL—Show Zinc Controls Corrosion is the title of a 32-page, illustrated booklet published by American Zinc Institute, New York, N. Y. Drawings, charts, and photographs together with brief comments present the corrosion control characteristics of zinc coatings, zinc pigments, and zinc anodes. An extensive selection of farm, industrial, marine and building applications of zinc is reviewed. .....Item 126

VALVES AND FITTINGS CATALOG—A 24-page catalog, No. R-5, giving size and application data for a line of brass valves, accessories, and fittings for refrigeration and air conditioning applications is issued by Superior Valve & Fittings Co., Pittsburgh, Pa. Recent technical data on relief valves, check valves, and low micron testing of standard line and globe valves are also included in the catalog. .....Item 128

BI-METAL DATA SHEET—A technical data sheet on a thermostat bi-metal, AEC-3, is released by the engineering department of the American Silver Co., Industrial Div., Flushing, N. Y. The data sheet contains engineering data and deflection curves on the bi-metal. .....Item 126

BULLETIN ON CONTROL CENTERS—A bulletin on air-conditioning control centers for manufacturers of year-round air conditioning units is available from Penn Controls, Inc., Goshen, Ind. The 12-page publication, designated Bulletin No. 1054, describes various control centers for commercial and residential air conditioning. Wiring hook-ups for single- and two-stage systems are included. .....Item 127

WARM AIR HEATER CATALOG—A general catalog, No. GC-4-55, of direct-fired warm air heaters is announced by Pratt-Daniel Corp., Thermobloc Div., South Norwalk, Conn. The catalog is printed in two colors, and there is a full color cut-away illustration of a Thermobloc heater. There are photographic reproductions of five models and dimension drawings of floor and suspended models. .....Item 128

READY LISTS ALUMINUM DATA—A wall chart giving weight and bend data on aluminum sheet in standard alloys has been prepared by Kaiser Aluminum & Chemical Sales, Inc., Oakland, Calif. The chart is divided into three tables which provide data on weight per sq ft, weight per sheet in standard sizes, and approximate radii for 90-deg cold bends of aluminum sheet in various gages, alloys, and tempers. .....Item 130

ROTARY MACHINE BULLETIN—Bulletin 15-B, issued by Niagara Machine & Tool Works, Buffalo, N. Y., catalogs the company's line of hand and power operated rotary machines, rolls, and accessories. An illustrated selection chart, showing various job operations, is included to simplify the selection of machines. .....Item 131

STEAM GENERATOR CATALOG—A 16-page catalog on a series of packaged steam generators is issued by Foster Wheeler Corp., New York, N. Y. The catalog gives capacities, dimensions, construction features, instrumentation, accessories, sectional drawings, and installation photographs. It also includes a chart for the selection of firing equipment. ...Item 132

PLEASE SEND US MORE INFORMATION. Circle below item numbers on which you wish further information.

1	11	21	31	41	51	101	111	121	131	2	12	22	32	42	52	102	112	122	132	3	13	23	33	43
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58	108	118	128	138	9	19	29	39	49	59	109	119	129	139	10	20	30	40	50	60	110	120	130	140

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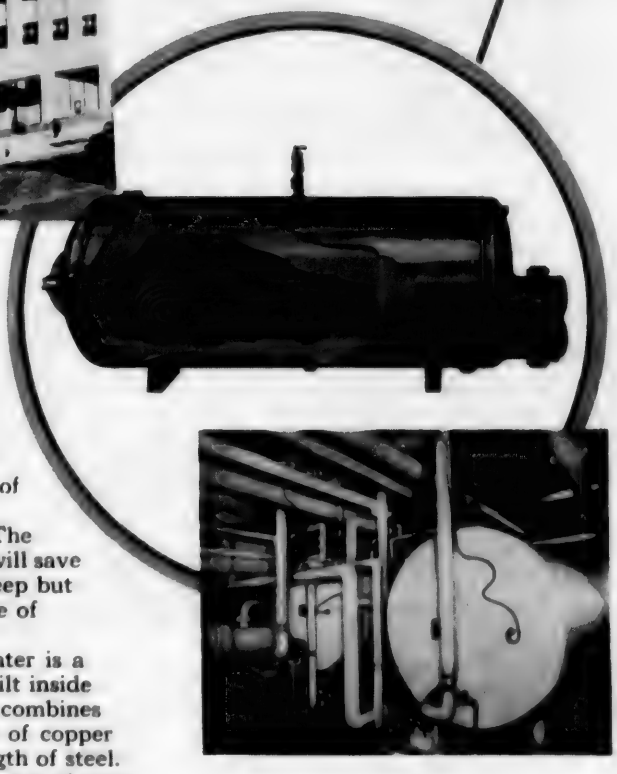

Copper-lined water heaters manufactured by p-k are a sound investment, especially for big, modern buildings such as the Dun and Bradstreet building. In their new office building at 99 Church Street in New York City, these copper-lined storage heaters supply 180 deg. F. water for the cafeteria and 130 deg. F. for general use. An abundant supply of rust-free hot water is constantly available at the turn of a spigot. The flawless operation of the heaters will save money—not only in heater upkeep but also in the proper maintenance of building services.

The p-k copper-lined heater is a complete copper heater built inside of a heavy steel shell. It combines non-corrosive properties of copper with the superior strength of steel.

For an unfailing source of pure, rust-free hot water—

Architects: Reinhard, Hofmeister & Walquist.
Consulting Engineers: Syska & Hennessey, Inc.
Heating Contractor: J. L. Murphy, Inc.

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New Low Cost Central Heating System

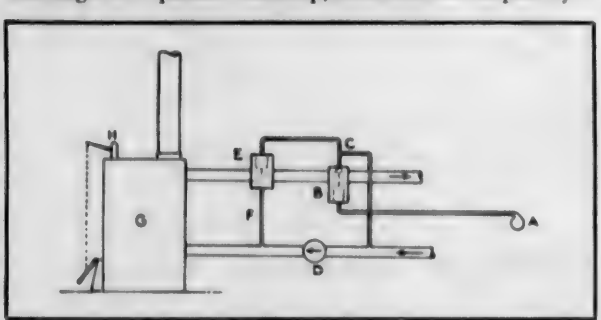
Reconstruction of the Old Bailey Criminal Court, small heat flow meters for research purposes, and a new low cost system of central heating for basement-less houses are discussed in this month's letter from our correspondent in Britain.

PERHAPS when this appears in print readers in the U. S. will be thankful that the worst of the hot weather is over. Britain at the time of writing is in general enjoying a period of sunshine that makes each new day a happy one. Itinerant storms have efficiently watered our gardens without wasting many hours over the job. Letters are being written to the newspapers suggesting that perhaps we have the atomic bomb experiments earlier in the year to thank for those blessings. Of course, there is a dark side. A number of people struck by lightning, and several homes flooded by the falling of a month's rain in an hour or two. But these calamities (until our turn comes) seem chiefly to happen to other people, and meanwhile the sun is really shining. It is doubtful, for instance, if the workers in a Birmingham chocolate factory were much distressed by the misfortune that they suffered; the thermometer climbed so high (over 80 deg) that in the non-air conditioned building the chocolate refused to set firm enough to pack, and the staff were sent home.

Institutions

However, Birmingham was never a city to be left behind, and with a new design for a hospital operating theatre is sharing in the great surge forward in heating, ventilating and air-conditioning fields that is now apparent on this side of the Atlantic. The Dutch Central Heating Association with its journal has moved into new headquarters and editorial offices in The Hague, and in London the Institution of Heating and Ventilating Engineers has acquired new premises at 49, Cadogan Square, S.W. 1.; besides the essential office rooms, the institution now has a dignified Council Chamber and a Member's Room and Library. The British Coal Utilisation Research Association has completed a new laboratory building especially for heating and air-conditioning research. Last but not least, the world's most famous court and jail, the Old Bailey, has been reconstructed internally as to its heating, air-sanitation and other services.

The new idea in operating theatres, so far only in the stage of a plaster mock-up, has been developed by a research team from the Birmingham Regional Hospital Board—a fact which by some will be regarded as one of the fruits of nationalising the hospitals, because it is obviously difficult for the voluntary supporters of a city's hospital to maintain expensive research into building studies. One aim of the new design which has a domed roof, is to eliminate infection during operations, while providing good watching facilities for medical students. The domed roof has in it more than 100 portholes. These can be used for lighting projectors or as observation windows. There is provision for 82 lighting projectors to illuminate the surgeons work from different angles. Bacteriologically purified air at the desired temperature and humidity is introduced at the top of dome and specially designed outlet ports are located in the floor.



Flow and control diagram of new central heating system for houses, under development at the British Coal Utilisation Research Association, England.

It was "business as usual" at the Central Criminal Court, Old Bailey, during the process of modernization. The Corporation of London entrusted the job to W. W. Nobbs, consulting engineer, but he did not live to see its completion. His daughter, also an I.H.V.E. member, took over, and has recently described the undertaking in a paper to the Institution (*Journal* **22,** 302). The old system was a marvel in its day, but it was scarcely designed with an eye to fuel economy. At the beginning of each session there are likely to be full prison cells and judges working in all the courts to empty them. Towards the end perhaps there will be only one court in use, and the former occupants of the cells will have dispersed to more permanent abodes. The best known of these places of education in good behaviour is Princeton, situated in the middle of desolate Dartmoor; it was in the news recently when the warders protested against the closing of the branch railway line which is their only connection with the outside world.

The former system at the Old Bailey had to be used in full or not at all, even if only one magistrate or a handful of lawyers were at work. Also the air supply had many drawbacks. The plenum system was used in the courtrooms, with no positive circulation, and this was so inefficient that if a case caught the public fancy and packed the court it was necessary to spray essence of violet into the supply air. The temperature was controlled at one point for the whole building, and although the air was filtered (through coconut matting which was occasionally given a good beating to clean it) it was distributed to the upper floors from a labyrinth of basement passages which were used as walkways giving access to vaults, and were quite dusty.

A German bomb destroyed part of the building during the war, putting out of action two of the passenger lifts, and leaving only the Lord Mayor's or judges' lift serviceable; this moved at a speed commensurate with the dig-

(*Concluded on page* 128)

BARBER COLMAN

ELECTRIC-ELECTRONIC

Control Centers

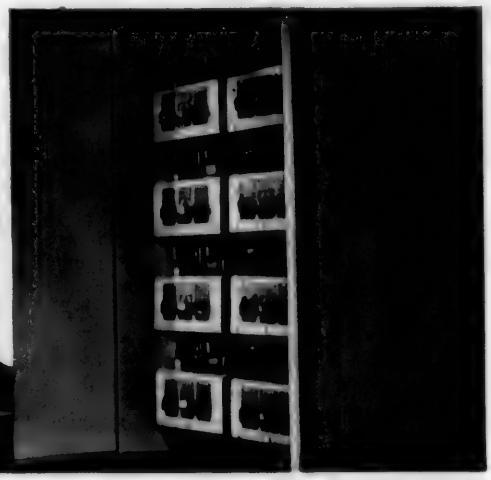
. . . simplified air conditioning system installation in new office building of . . .

MONONGAHELA POWER COMPANY

It's Barber-Colman throughout! From the electric-electronic controls in modern Control Centers, to the Uni-Flo engineered air distribution, this new home office of Monongahela Power Company has the very latest equipment for modern-day comfort. Desired temperature levels are maintained in the 150 rooms the year round, with a minimum of attention. Each of the eight zones has its own control system for maximum flexibility at minimum cost.

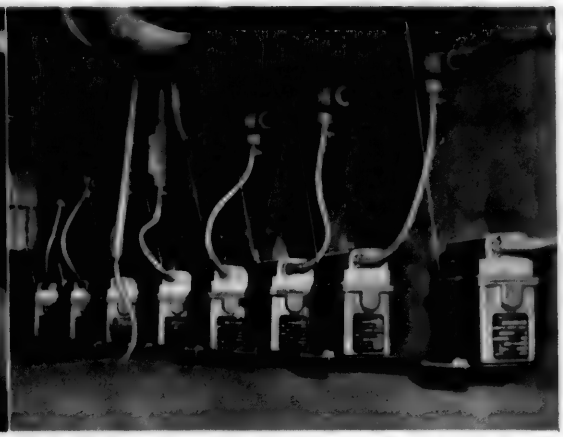
Architect: C. E. SILLING & ASSOCIATES, Charleston. *Mechanical Engineer:* JOHN PAUL JONES, CAREY & MILLAR, Cleveland. *General Contractor:* SOUTHEASTERN CONSTRUCTION CO., Charleston. *Mechanical Contractor:* STUART-McMUNN CO., Clarksburg.

$1,500,000 General Headquarters Office Building of Monongahela Power Company in Fairmont, West Virginia. This is "nerve center" of utility serving over 200,000 customers in a 12,596 square mile area. Complete building has all-year air conditioning.

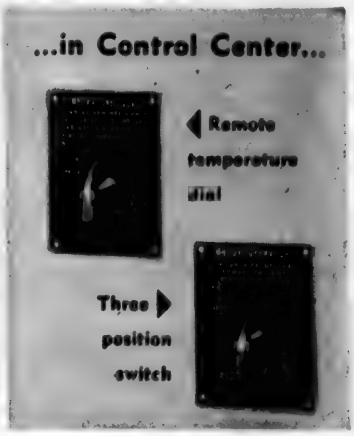


Control Centers function as central junction boxes, house pre-wired accessories, numbered terminal strips for connecting all electrical components. Wiring is simplified, installation decreased, servicing minimized.

Motor-Operated Valves, with oil-submerged operators, provide control of heat exchangers and chilled water supply.



Barber-Colman Control Motors, proportioning-type, operate hot and cold deck dampers. Long and dependable operation assured by oil-submerged motor switches and gear train.



Legible, easily read dials, convenient for authorized personnel, are exclusive with Barber-Colman Electronic Controls

You would expect electrical power engineers to favor *electrical* controls. After all, these experts are familiar with the speed, flexibility, accuracy, and reliability of electrical equipment. Utility companies make it a policy to use and recommend latest developments in the electric-electronic world.

Monongahela Power Company engineers followed those lines of thought in approving the Barber-Colman system of electric-electronic temperature control. Outdoor reset controls position motor-operated valves in accordance with outdoor conditions. Two averaging-type thermostats in each zone actuate an averaging control in the respective Control Center, positioning mixing dampers. The result is a dependable, simplified control system which provides comfortable warmth or refreshing cool air in varying degrees to each zone, taking into consideration outdoor temperatures, internal loads, solar exposure, and requirements of the occupants.

Barber-Colman application engineers are available in a nearby Field Office, or write us for data, prices, and information on any automatic control problem.

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(*Concluded from page* 126)

nity of these personages, namely 100 fpm, and some of them found it quicker to walk. In the reconstruction this has been speeded up by 50%, and three new lifts have been installed. Barristers are now hustled to their rooms on the 8th floor at 400 fpm, and the service lift that carries meals from the kitchen no longer carries buckets of coal as well. Also the radiators in the judges' corridor are not now taken off the hot-water service!

Each Court has been provided with an independent air-conditioning system, and the presiding judge can adjust matters to suit his own comfort. There is a fair amount of new oak panelling in some courts and this has saved it from excessive shrinkage. Four water-cooled 25 hp refrigeration units have been provided, with a forced draught cooling tower. The staff select the number of units they consider necessary and thereafter operation is entirely automatic, the normal setting of the chilled-water thermostat being 45 deg with a differential of ± 2 deg. The most difficult task was that connected with the duct-work through the building, and in particular the inlets and outlets for balanced air flow in the Courtrooms. These are very high, and recirculation from 60 to 75% is allowed for. The seating under the jury and the counsel were turned into suction boxes, and trunking was incorporated under the judge's dais. Grilles with adjustable louvers were placed under each seat and around the front of the docks. Noise was a difficult problem but has been dealt with so effectively that the chief noise is still that of tube-trains rumbling through the ground below. Various technical details are given in the paper, but any engineer who has a similar tough problem in an old building could do worse than to organize a trip to this island and ask Mr. Sanders, Keeper of the Courts of London, to show him round.

New House Heating System

The British Coal Utilisation Research Association showed off its new Domestic Appliances Laboratory at an Open Day early this summer, attended by a representative and distinguished gathering of Britain's world of fuel. A cricket match was advertised as part of the day's festivities. Therefore it rained heavily for an hour or so, and the match was officially cancelled, only to start half-an-hour later. Your Correspondent does not understand cricket and cannot report on the game, but the research work under way was full of promise, and useful technical reports may be expected in the future. Two items in particular impressed your Correspondent: the use of silver-tellurium discs for measuring wall surface temperatures and heat emission, and a new method of installing central heating in houses not designed for it.

The little (½ inch dia.) silver alloy disc between two thin discs of copper, form a double thermocouple according to the rate of heat flow. It is fixed on to the wall surface whose heat-output it is desired to measure and is so small that it scarcely affects it, even locally. Wires are attached to the copper discs and an e.m.f. is produced according to the heat flow. Copper is a good conductor of heat and the disc in contact with the wall, as well as that side of the alloy disc, may be assumed to be at wall temperature. The alloy is not such a good heat conductor, and the greater the heat flow, the more the temperature drop through it. The second copper disc in contact with the outer face of the alloy thus forms a second thermocouple responsive to a lower temperature than the first and opposed to it. The difference between the two is communicated via the connecting wires to a potentiometer. Calibrated meters of this pattern are available commercially and the B.C.U.R.A. scientists are very satisfied with them and have checked their accuracy by independent tests. They are using them for determining, among other things, the amount of heat provided to a room from the brick of masonry setting of a heating appliance, compared with the radiation and convection direct from the appliance itself.

A diagram of the economical new central heating system is shown on this page. For simplicity, the calorifier circuit for supplying hot water service has been omitted. Most houses in this country are built with a gas or electric cooker, a coke "boiler" for hot water service in winter and an electric immersion heater for summer use, a coal-fire (perhaps of the "improved" type which can burn coke) in the living-room, and gas or electric points for occasional heating of the dining-room and bedrooms. There is no basement, so that even if central heating pipes of large enough diameter for natural circulation could be installed at reasonable cost and without rebuilding the house, no ground-floor radiators would work efficiently. The proposed new system is based on forced circulation and small diameter pipes which can be led unobtrusively round doorways and along skirtings. The recommended pipe size is ½ inch nominal copper or ⅜ inch nominal iron, through which the water is circulated at about 160 gph, giving a velocity of the order of 2 ft per sec. Two or three makes of circulating pumps are now available for this duty, consuming 70 to 75 watts. This much is simple, and the success depends on the control and its cheapness. This is where the research comes in.

The control system, and particularly the valves, is presently the subject of patent specification, so that the diagram only indicates the principles of the arrangement. The house owner can adjust the settings of the thermostats to give him the required comfort conditions, but thereafter the automatic control is on the basis of external temperature. In cold weather the circulating pump forces water at full boiler temperature round the system and the by-pass is closed. An outside temperature sensing element *A* of the liquid-filled type is provided, and as the weather becomes milder this expands the bellows in the valve *B*, thus tending to close the connection between the tube *C* and the outflow pipe. The tube *C* is of very small diameter and is connected to the inlet of the pump *D*; in consequence, the pressure in it falls, and the bellows in the mixing valve *E* contracts. This results in a partial opening of the by-pass *F* and a corresponding partial closing of the inlet from the boiler *G*. The boiler is provided with a thermostat *H* which operates to keep the water discharge temperature constant. This is of a crude but effective type commonly fitted to coke boilers; an adjustable link connects the arm with the flap valve on the air inlet, so that the air supply is restricted if the water gets too warm.

The success of the system will depend on the cost and reliability of the special valves *B* and *E*, which have been designed and constructed in prototype in the well-equipped machine-shop of B.C.U.R.A. If this aspect is commercially satisfactory, there should be a good future for the system, and not only in this country.

Wheeling also manufactures a complete line of Galvanized Furnace Pipe, snap lock or closed seam Perimeter Heating or Air Conditioning Pipe, and accessories.

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BOOK REVIEWS

Publications abstracted in this department should be ordered direct from publisher.

TRANE AIR CONDITIONING MANUAL

For over a span of 17 years, students and engineers who desired detailed information about air conditioning —how it functions and the steps necessary in the design of a system—have found a wealth of helpful information in the Trane Air Conditioning Manual. Since its first printing in April, 1938, it has gone through a number of printings and several revisions. The manual has now again been completely revised, its third revision, and a new edition is available. This marks its third revision and its twenty-first printing.

The manual has been brought up-to-date with new terminology, new tables and new illustrations. However, the general pattern of the book remains the same. The book is essentially practical. It is concerned primarily with the application of the fundamental facts of engineering to the design of air conditioning systems. Many tables and charts have been included for convenience in making computations. In general the text covers heat gains, psychrometry, calculations for the conditioned air supply, refrigeration for air conditioning, water for air conditioning, and ducts and fans

Trane Air Conditioning Manual. Cloth bound, 8½ x 11 inches, 380 pages. Published by The Trane Company, La Crosse, Wis. Price, $5.

TECHNIQUES OF PLANT MAINTENANCE

As part of the Sixth National Plant Maintenance and Engineering Show that was held in Chicago, January, 1955, technical sessions were held at which were presented a number of papers and round table discussions of topics related to this field.

This book is made up of the papers that were given at the conference, a transcript of the discussions that followed them, and reports of the round table sessions at which specialized phases of the maintenance function were considered.

Techniques of Plant Maintenance and Engineering, 1955. Cloth bound, 8½ x 11 inches, 218 pages. Published by Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y. Price, $7.50.

BRAZING MANUAL

Top experts in the country working together as the Committee on Brazing and Soldering of the American Welding Society, has prepared a long-needed manual on the subject of brazing.

Complete and valuable information is given on each of the following processes: Torch brazing, twin carbon arc brazing, furnace brazing, induction brazing, resistance brazing, block brazing and flow brazing. Every metal of industrial importance, common and rare, is described in terms of techniques of brazing including equipment, precleaning, surface preparation, post-braze cleaning and inspection. In an appendix is listed properties of brazeable metals and alloys.

For the first time, brazing fluxes and atmospheres are standardized into types according to their compositions and uses. In addition to production and design information, the manual covers testing, quality control, safety, health protection plus detailed explanations of causes and defects and how to correct such conditions.

Brazing Manual, by the Committee on Brazing and Soldering, American Welding Society, Cloth bound 6 x 9 inches, 193 pages. Published by Reinhold Publishing Company, 430 Park Ave., New York 22, N. Y. Price, $4.75.

THERMODYNAMICS REFRESHER

A refresher in thermodynamics has been prepared for those studying to take an examination for a professional engineer's license. This is a second edition of this book and problems have been added dealing with processes of gases, reciprocating steam engines and turbines, internal combustion engines, vapor compression refrigeration and fundamentals of air conditioning. All problems have been taken from examinations given by several states. Included is a new chart for steam to determine specific volume, pressure and enthalpy.

Thermodynamic Refresher for Professional Engineers License, by J. D. Constance. Paper bound, 11 x 8½ inches. Published by J. D. Constance, 625 Hudson Terrace, Cliffside Park, N J. Price, $3.25.

• • •

SYMPOSIUM ON METHODS OF TESTING BUILDING CONSTRUCTIONS—In this Symposium of Methods for Testing Building Constructions there are several papers on testing, evaluation and performance of building construction. The papers deal with several factors and basic types of materials. This symposium was sponsored by ASTM Committee E-6 on Methods of Testing Building Constructions and was presented at the annual meeting held at Chicago, June, 1954. Building constructions are being tested according to specified procedures although there is great need to establish allowable loads from test data. American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa. Price $2.75.

NEW NFPA PUBLICATIONS—Three new publications of interest to this field have been issued by the National Fire Protection Association. Standards for the Installation, Maintenance and Use of First Aid Fire Appliances (NFPA No. 10) were adopted at the NFPA annual meeting in May, 1955, and a new section adopted covering metal fires. Price of the 70-page booklet is 50 cents. NFPA No. 220 on Standard Types of Building Construction is the result of several years work by the association's Building Construction Committee; price 25 cents. NFPA No. 90B on Standards for the Installation of Residence Type Warm Air Heating and Air Conditioning Systems is confined to the residence type central warm air heating systems, including combination heating and air conditioning systems. It does not apply to air conditioners in which no heating is incorporated or to heat pumps. Price, 35 cents. National Fire Protection Association, 60 Batterymarch St., Boston 10, Mass.

Why you're ahead 3 ways with Modine UNIT HEATERS

Horizontal Unit Heaters are built in 21 standard and low-outlet-temperature steam models, 5 hot water models. Verticals are available in 26 models, 13 sizes for steam and hot water. And there are 10 Power Throw standard and low-outlet-temperature models.

Special HCR Models for use where corrosion is a problem

To reduce maintenance and replacement costs in systems where corrosion is inherent, Modine offers a specially built line of premium units. These HCR models retain the light weight and excellent performance of standard Modines — ALSO PROVIDE EXCEPTIONAL RESISTANCE TO INTERNAL CORROSION.

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Superior design and engineering of Modine steam and hot water unit heaters provides stepped-up performance and greatly reduced weight and bulk. Largest model . . . 2540 Edr. . . . weighs only 248 lbs. Light weight and compactness make Modines easier to handle and install. You save money right from the start.

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All models feature discharge air temperatures in the 110° to 120° range. Exact temperatures are correctly related to discharge velocity to insure desired heat throw and perfect comfort . . . optimum fuel economy. Horizontal models feature built-in velocity generators which step up heat throw for greater penetration of cold air strata near floor,

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PRODUCT APPLICATIONS

New, Unusual, or Ingenious Uses of Equipment and Materials

Conducted by WM. B. FOXHALL, Associate Editor

Grass Grower Uses Hot Water

PROBLEM: At Summit Hall Turf Farm, Gaithersburg, Md., manager William H. Wilmot was faced with the problem of getting some of his special grass, Meyer Z-52 Zoysia, ready for the annual winter flower show in nearby Washington, D.C.

SOLUTION: Suburban Propane Gas Corp. in nearby Rockville, Md., suggested that an eight hundred series Ruudiator gas boiler would supply more effective greenhouse heating than was contained with the domestic type water heater. This boiler, made by Ruud Mfg. Co., Kalamazoo, Mich., was connected to propane cylinders. Hot water for the boiler was circulated through 900 feet of copper pipe underneath the turf. More hot water was supplied to two overhead downflow heaters. The boiler occupies a separate workshop building ten feet from the greenhouse. Underground pipes carry the water heated to 145 deg F to the greenhouse. Boiler input is 150,000 Btu per hour. A thermostat in the turf controls the boiler and circulating pump. Manually controlled valves regulate the amount of water passing through underground piping and unit heaters. About 2,000,000 Btu of propane gas are consumed daily resulting in a heating bill of $4.50 a day.

RESULTS: The special grass which was brought back from the Orient in 1906 by the U. S. Agriculture Department and has been improved for U. S. climates, was made summer green in time for the flower show. Both soil and air of the greenhouse have reached 78 to 80 deg F on a 40-degree day. The outcome was a blue ribbon at the flower show and thousands of visitors and prospective customers at Summit Hall.

Plastic Pipe Handles Plating Process

PROBLEM: Frequent, costly replacement of metallic pipe and fittings, and excessive maintenance required for circulating normal nickel plating solutions through four nickel plating tanks at the Bloomfield, N. J. plant of the Lamp Division, of the Westinghouse Electric Corp., created a need for improved corrosion-resistant pipe. The pipe required had to be highly resistant to a low pH nickel plating solution. Further, it had to carry this solution at 150 deg F operating temperature, at a rate of 200 gph with low maintenance and simple installation.

SOLUTION: Specified was Alpha normal impact rigid PVC (polyvinyl chloride) pipe, manufactured by Alpha Plastics Inc., West Orange, N. J. The pipe and fittings, including 100 ft of ½-inch and 60 ft of 1½-inch pipe, were supplied and installed in September, 1954. The PVC pipe carrier the solutions to heat exchangers and return to the plating tanks, as well as through a filter. End product of the nickel plating bath process is nickel-plated copper and iron for lamp lead-in wire and supports.

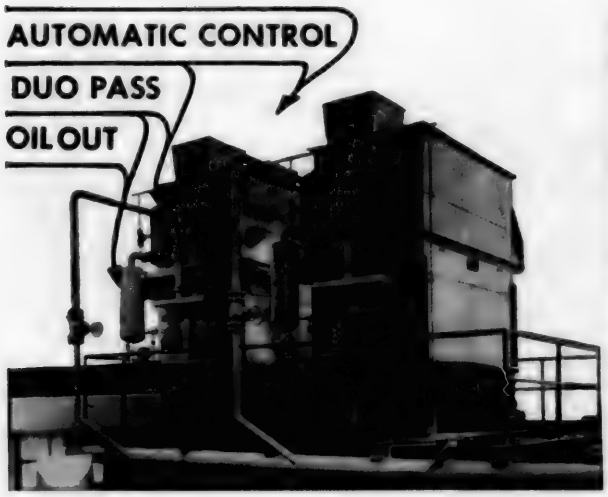
RESULTS: The manufacturer indicates satisfactory corrosion-resistant performance of Alpha rigid PVC pipe after eight months use in its nickel plating process. A minimum of maintenance has been required, and the pipe has effectively resisted the corrosive nickel plating solution, giving dependable service, with low maintenance.

Oil-Fired Unit Heats Car Wash

PROBLEM: When a car-a-minute car wash operator tried to operate during severe cold winter days, he found that with both the in and out doors open, the cleansing water turned to ice as soon as it hit the cars they attempted to wash. The steam jenny used to clean the white wall tires consumed all of the gas that could be brought into the building through the main. Gas unit heaters could not be used because of insufficient supply. It was necessary to close down on those days when the temperature dropped to freezing and below freezing.

SOLUTION: A Delta oil-fired unit heater was installed near the entrance of the building. A vertical louverd diffuser was attached to the front of the unit heater and it controlled the movement of air in both directions—towards the open entrance and through the rest of the long, narrow building. The horizontal air flow louvers located behind the vertical veins directed the air downwards towards the moving cars. The unit heater installed has an output of 220,000 Btu per hr and its burner uses ordinary No. 2 heating oil. The large propeller fan moved 6500 cfm of air at a velocity of 200 fpm.

RESULTS: Half of the high velocity heated air produced establishes a warm air blanket across the open entrance, while the balance of the air is thrown towards the large blower used to air-dry the washed automobile. This blower picks up the heated air from the oil-fired unit heater and recirculates it to heat the rest of the long, narrow building. The operator reported 50 deg F. inside temperature when the outside air was at zero with both doors open. This installation, of course, increased his open hours and his volume of business.



SAVE HALF THE ENGINEER'S TROUBLES WITH A REFRIGERATION PLANT

Hundreds of engineers have been interviewed about their experience with the Niagara Aeropass Condenser. In one way or another, they say, "I wouldn't go back to anything else." And their managers, who watch costs, say, "Best investment we ever made, couldn't operate now, without it."

Niagara Aeropass Condensers have three exclusive features which save trouble and money in running a refrigeration plant:

"The Duo-Pass"— keeps scale and salts from crusting the coils, keeps the condenser always at full capacity.

The "Oilout"— removes oil and dirt from the refrigerant, at the exact point where the oil vapor is condensed and the refrigerant is not.

The "Balanced-Wet-Bulb" control gives automatic operation at the minimum head pressure, saving power cost the year 'round!

In addition, the Niagara Aeropass Condenser saves nearly all your cost of cooling water, quickly bringing back to you the cost of installation. In plants where refrigeration is a production process, owners know that this condenser has reduced their costs.

Write for Bulletin 103; Address Dept. HV.
You can see one of these installations near you.

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District Engineers in Principal Cities of United States and Canada

DOERR Motors
solve problem
on Bush
Jet Coolers

Ceiling Jet Unit Coolers, a product of the Bush Manufacturing Company, of West Hartford, Connecticut, have the responsible job of maintaining continuous low temperatures in cold storage rooms. This calls for reliable motor operation, usually in the presence of high humidity.

The Doerr 1/10 hp, 1140 rpm, Type C, permanent split capacitor motor selected had to be suitable for replacement in existing units in the field. The band mounting used restricts the frame diameter and height is also at a premium. The unusual method shown for mounting the capacitor provided the answer and has simplified assembly in both production and in servicing.

This is another instance where Doerr has helped with a special design. If you have an unusual motor problem, please let us hear from you.

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CEDARBURG, WISCONSIN

YOU GET **MORE**
with
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Electric Motors from 1/30 to 5 hp.
Standard or designed to your specifications.

Gas Heater Serves Trailer

This 16,000-Btu Perfection X 16 unvented gas space heater has an unusual job. It is installed in a huge semi-trailer to keep foodstuffs from freezing during very cold

weather. Bursley & Company, Inc., a large wholesale grocery company of Ft. Wayne, Indiana, came up with the idea of protecting their precious cargoes by using a heater ordinarily associated with use in the home. A 20-pound L-P gas cylinder, installed under the trailer, supplies the fuel for the heater. Perfection Industries, Inc., Cleveland, Ohio, is the manufacturer of this heater.

Heating Coil Resists Fouling

PROBLEM: Fouling of pipe coils used in industrial process heating reduces efficiency of heat transfer and occasions costly, unproductive downtime and expensive maintenance. An automotive manufacturer, for instance, had a 6 by 6 by 6 foot bonderizing tank heated with a pipe coil. Although a temperature of 180 deg F was desired, only enough pipe coil could be placed in the tank to bring the temperature up to 140 F In addition the pipe coils had to be pulled out of the tank at least once a week to have deposits pounded off.

SOLUTION: A Platecoil unit, product of Tranter Manufacturing, Inc. of Lansing, Mich., was installed. The unit consists of two embossed sheets of metal welded together to form channels for the passage of heating or cooling media. In addition to providing an effective heat transfer unit, the Platecoil also has the ability to shed scaling as it forms in many instances.

RESULTS: The Platecoils proved not only capable of bringing the temperature up to 180 deg F in the bonderizing tank, but also resisted scaling so successfully that in the first six months they never had to be removed for cleaning.

New Insulation Method Cuts Maintenance

PROBLEM: For a 400 hp steam generator recently installed at the Westchester Country Club in Rye, N. Y., a method of isulation was required which would be easy to maintain.

SOLUTION: A new technique developed by Cleaver-Brooks and Aljon Mfg. Co. of Maspeth, N. Y. was used. The method consists of applying a layer of preformed Fiberglas insulation and covering it with 20 gage aluminum. One day was required to place the Fiberglas blocks and secure them in place with wire cable. Another two days were needed to install the 401 sq ft of aluminum sheet jacket. The procedure is to insulate the boiler as soon as it is set in place, before any piping is done. Holes are cut in the aluminum to accommodate all piping. The aluminum sheets are secured by ¾-inch stainless steel bands and seals.

RESULTS: This type of insulation costs no more than conventional finish of asbestos and portland cement. Advantages are that, once installed, it is easy to clean, never requires painting, and protects the insulation.

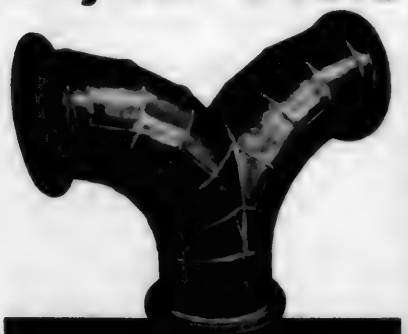
Heat Resistant Finish Meets Test

PROBLEM: A paint with quality finish, yet durable enough to withstand high temperatures, was needed by the Cleaver Brooks Company, Milwaukee, when introducing its new CB line of packaged boilers.

SOLUTION: After experimenting with many leading finishes, Cleaver Brooks engineers adopted a special formulation of Sicon, a silicone heat resistant finish manufactured by the Midland Industrial Finishes Company, Waukegan, Illinois.

RESULTS: Sicon, in tests proved to posses not only more than the required heat resistance properties. but retained its color and gloss very satisfactorily. The company reports that as a result, Sicon in gray and maroon is now used on all CB models and has proved very satisfactory in its heat resistance, fine appearance, and ease of application.

Cut Piping Layout Costs



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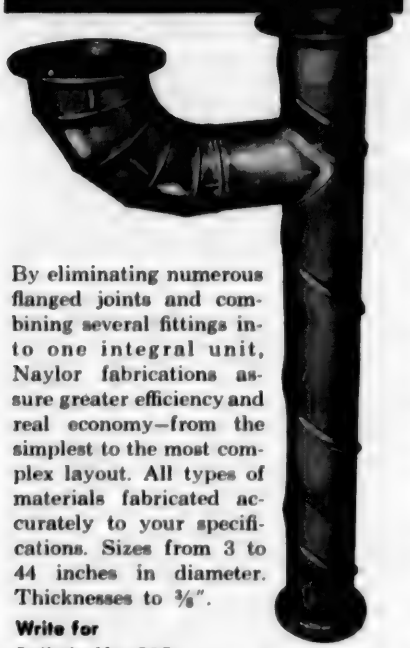
Time, Material and Labor



By eliminating numerous flanged joints and combining several fittings into one integral unit, Naylor fabrications assure greater efficiency and real economy—from the simplest to the most complex layout. All types of materials fabricated accurately to your specifications. Sizes from 3 to 44 inches in diameter. Thicknesses to ⅜".

Write for Bulletin No. 525.

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COOLING TOWER NEWS

This Binks Series 3-B forced draft cooling tower provides more than ample cooling for the 160 tons of air conditioning needed for this university chapel...and does it extremely quietly.

Quietness and compactness win contract for Binks Cooling Tower

Leading Southern University picks Series 3-B Tower for chapel roof.

These modern forced draft, low silhouette, cooling towers featuring the dry blower air propulsion system, are designed for use where high cooling efficiency is demanded, combined with whisper-quiet performance and compactness. Squirrel cage blowers supply ample air movement at tip speeds far less than noisy propeller-type fans.

High cooling efficiency is obtained due to thorough water break-up from Binks patented Rotojet nozzles, combined with internal redwood nailless decking. They also feature counter-current operation with air movement in opposite direction to water flow.

Heavily galvanized, these towers reduce maintenance to a minimum. Interior surfaces are fully sprayed with a tough mastic coating. The air propulsion assembly is located in the dry air stream to protect it from corrosion. Series 3-B towers are completely shop fabricated, ready for easy assembly.

The compact design and low silhouette of this tower keeps it out of sight from street level.

FOR FULL INFORMATION about Binks complete line of natural and mechanical draft cooling towers, write direct to the address below. Binks engineers will gladly help you select the right tower for your specific needs.

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EVERYTHING FOR WATER COOLING
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A COMPLETE LINE OF NATURAL DRAFT AND MECHANICAL DRAFT COOLING TOWERS AND INDUSTRIAL SPRAY NOZZLES

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NEWS OF THE MONTH

CONTROL RESEARCH

at Minneapolis lab stresses heat transfer and product adaption to needs of comfort and productivity.

New ideas, materials, processes and products are being sought in the automatic controls industry. A $4.2-billion business today, its leaders predict it will grow to $12-billion by 1975. And, perhaps nowhere are the fundamentals of research in automatic controls and instrumentation receiving more attention than in a tree-shaded brick building located on a 10-acre suburban site in the village of Hopkins near Minneapolis, Minn. This is Minneapolis-Honeywell's Research Center with a staff of more than 100 scientists, technicians, and others.

The extent to which research affects Honeywell's operations is shown in a recent statement by Paul B. Wishart, president, when he disclosed to visiting reporters and editors that 10% of the products sold in 1953 were not even manufactured in 1952.

Honeywell's research scientists under the direction of Dr. Finn Larsen delve into such fields as metallurgy, ceramics, heat transfer, plastics, vacuum tubes, magnetic materials, semi-conductors, combustion nucleonics, electronics, humidity, ultrasonics, agriculture and many others. Supplementing the Center's work is extensive "applied" engineering in the firm's varied manufacturing divisions from which come more than 9,000 different products, all with a common denominator: automatic control. They may be heating, ventilating or air conditioning controls for homes, office buildings, busses or atomic submarines. Or they may be measuring and recording devices for a multitude of other applications.

• **SCOPE.**—With one out of every 10 Honeywell employees engaged in some form of scientific or engineering work, the research scientist is aided by a far-flung corps of sales engineers, field engineers, designers, model makers, environmental test engineers, methods engineers, production technicians and many others both in the factory and in the field.

How this close interrelationship works is illustrated by the Research Center's work in the field of ceramics. The age-old skills of pottery making have become paramount today in electronic applications where ceramic transducers are used to convert electrical signals into some other form of "work."

The ceramics laboratory is, therefore, one of ten separate "labs" in the research operation. Here barium titanate materials are processed in accurately controlled furnaces, some of which are capable of maintaining temperatures over 2,000 deg C. From the laboratory have come new and improved transducers for ultrasonic detection of underwater objects, ultrasonic cutting and cleaning tools, electronic-pneumatic controls for heating and air conditioning systems in skyscrapers, improved Brown instruments, new ceramic valves and switches, and tiny ceramic cores on which spider-web wire is wound for electronic potentiometer bobbins and gyroscopes.

Other Research Center laboratories deal with electronics, humidity, magnetic materials, radioactivity, combustion tubes, and transistors and other semi-conducting materials. To each of these labs flow requests for a product that is not commercially available or does not meet the required standards of quality. From each may come new ideas, new materials or processes, or new products and systems that have far-reaching effects on the operation of the company and its several divisions.

Transistors—tiny power devices that are replacing vacuum tubes in many electronic applications—are "grown" in electric induction furnaces under watchful eye of M-H physicist.

• **TRANSISTORS.**—The transistor is typical. This adaptation of the tiny catwhisker and crystal of the early days of radio is today being hailed as one of the most significant advances ever made in the brief but brilliant history of electronics. As a pioneer in the application of electronics to automatic control, Honeywell began studying and testing transistors as soon as they became available.

First models were tested and found wanting. Their small power handling capacity was the chief reason they could not be successfully used in electronic control applications. To overcome this problem, Honeywell's Research Center launched in 1951 a semi-conductor project. From it came a new, power-type, germanium transistor many times more powerful than any commercially available at that time.

Immediately this new power device was applied to Honeywell controls, including a transistorized aircraft fuel measurement system that was 75% lighter and 86% smaller than comparable systems using vacuum tubes.

To make possible these experimental product developments, basic supporting research is conducted in such fields as ceramic-to-metal seals, cathode materials, cathode and grid structures, grid-fabrications, and filament insulating techniques. From it has come a new type of oxide-coated cathode which does not have a sprayed outer coating but uses an internal dispenser technique. A planar grid winding machine has also been built in the laboratory.

(*Continued on page* 138)

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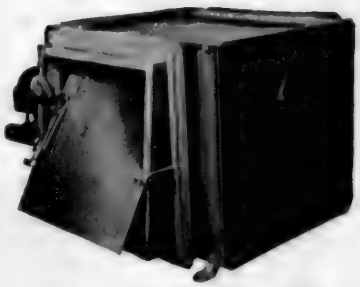

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CONTROL RESEARCH

(*Continued from page* 136)

• **COMBUSTION.**—In the field of photocells, a new lead sulfide cell has been built which meets the rigid requirements of sensitivity and fast response needed by electronic flame detection systems for large industrial burners. It is now in pilot-line production.

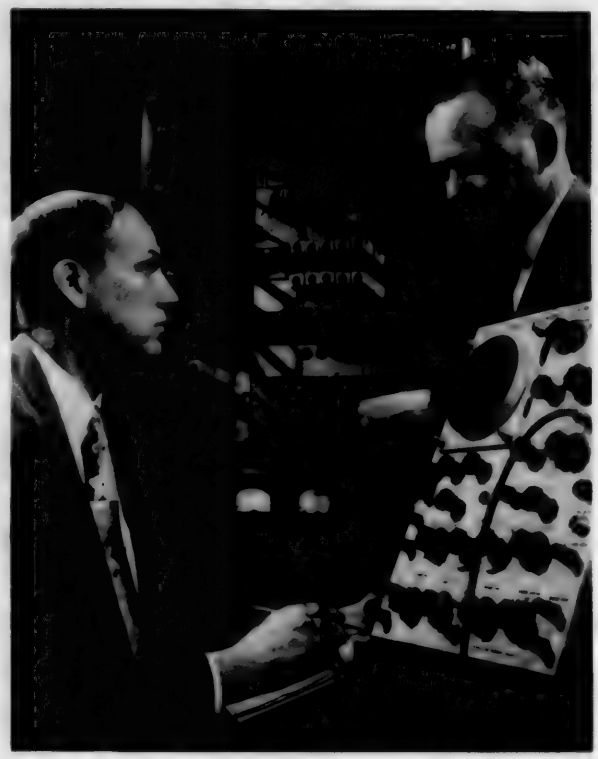
Electronic flame-detection is another field in which Honeywell has pioneered. Its combustion research has made a major contribution to increasing the heating industry's knowledge about flame. Today in its combustion research laboratory, infra-red spectometry is being adapted to the analytical needs of the combustion research scientists who learn new things about flame by studying the spectral emission given off by fire in different burners and using different types of fuel. This laboratory is equipped with furnaces for both industrial and domestic type burners, using either gas or oil. Here the scientist uses a Brown continuous strip recorder to plot wave-lengths and intensities of radiation over a spectral range of 0.2 to 25.0 microns. The visible spectrum range is only 0.4 to 0.7 microns.

By replacing the sodium chloride or potassium bromide crystal prism in the spectrometer with one of quartz and by using photocells in place of thermocouples, the scientist also measures and records wave-lengths and radiant characteristics at the ultra-violet end of the spectrum.

Studies of invisible hot gases, boundry areas between cool air and warm air, the unignited gas in the outer portion of a flame and other combustion phenomena are studied by use of the Schlieren technique. A highspeed, 16 mm motion picture camera is used in photographing portions of burner flames that cannot be seen with the naked eye.

From studies of fuel-air ratio, primary and secondary air ratios, firing rates, and burner nozzle sizes, improved flame detecting devices are being developed and their proper location in the furnace burner determined.

Characteristics of flame—both gas and oil—are studied and photographed on special cameras to help improve combustion controls and burner safety equipment.



Analog, the result of three years of research, can simulate a house anywhere in the world and analyze its reaction to any kind of weather. Here, Dr. Preston McNall, left, demonstrates unit to Dr. Finn Larsen, M-H research director.

Already a pioneer in the field of electronic flame detection through the use of photocells, new developments like the company's lead sulfide cell spell greater safety for both the homeowner and the large industrial firm where flame-failures could create the threat of dangerous accumulations of explosive liquids or gases.

The electronics group has designed such special equipment as magnetic testing apparatus for the materials laboratory, induction heaters for tube and transistor development, and ultrasonic cutters and cleaning devices for general laboratory work.

• **HEATING COMPUTER.**—One of the latest devices to come from the joint efforts of the electronics group and the scientists engaged in heat transfer studies in an electronic brain that simulates a house and analyzes its reactions to any kind of weather. By anayltically simulating both the house and the weather around it, Honeywell scientists are cutting five years from the time now required to test heating and air conditioning equipment and building materials.

In operation the computer is fed such information about the house as areas involved, construction details such as size and type of doors and windows, type of outside material, insulation, etc. It then surrounds the house with any kind of weather and can, if desired, simulate its complete life span in a matter of minutes. New electronic developments incorporated into this unique analog

(*Continued on page* 146)

Kansas City goes "big league"
...installs

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in Municipal Stadium

Penn Dynafans serve the new locker room facilities for the newest entrant in the American League. Inconspicuous and easy to maintain, these units are depended upon to exhaust warm, moist air quietly. Many industrial and commercial ventilation problems are easily and inexpensively solved by these versatile units. Count on the Penn Ventilator man in your area for qualified and complete assistance on your next ventilation problem.

Complete literature available — write to Engineering Department

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- **EASE OF INSTALLATION** — no ducts, no complicated piping, no radiators or registers to fool with. Gas unit heaters can be installed in an existing structure as easily as in a new building.
- **INSTANT RESPONSE TO EVERY CHANGE IN TEMPERATURE** — heat produced on the spot in a matter of seconds after the control system calls for it.
- **LOW INITIAL COST** because the cost of the heater is the entire equipment cost — no piping or ducts, radiators or registers to buy.
- **SAVING ON VALUABLE FLOOR SPACE** — suspended units occupy no space which could be used for any other purpose.
- **EXTRA HEAT FOR TROUBLE SPOTS** such as areas facing large doors.

FOR HEATING

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- FACTORIES
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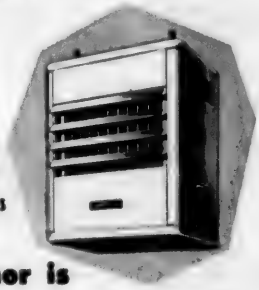
- RESTAURANTS
- SCHOOLS
- SHOWROOMS
- PUBLIC BUILDINGS
- AND MANY OTHERS



and here's why Reznor is **by far** the world's largest-selling gas unit heater

One out of every two gas unit heaters sold today is a Reznor. There are two reasons for this domination: "years-ahead" engineering and quality workmanship. An alert, aggressive product development program keeps Reznor ahead of the field in the introduction of improvements for greater heating efficiency, economy and comfort. High standards of craftsmanship and the use of only the finest materials and components insures for Reznor customers the full benefit of this engineering leadership.

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- CAST IRON RECEIVER
- LOW WATER LINE

Duplex Unit
25½" Diameter Receiver

Duplex units, with automatic alternators, furnish "extra" insurance, provide overload protection and guarantee an even longer life. Height of return above floor is 7⅜".

Fig. No. 303 B

Single Unit
21" Diameter Receiver

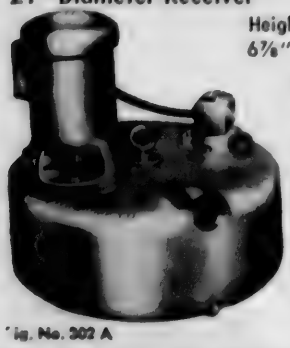


Fig. No. 302 A

Height of return is only 6⅞" above floor.

Single units of any rating can also be furnished in the 25½" diameter receiver. This receiver is furnished machined and drilled for the addition of another pump and control so as to enable conversion to a duplex unit at a later date.

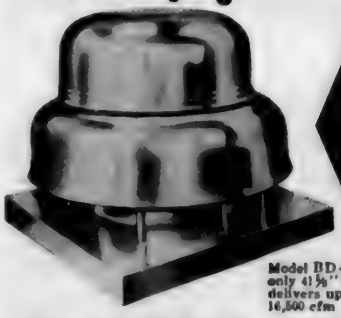
Capacities From
500 to 10,000 sq. ft. E.D.R.
Up to 30 lbs. discharge pressure

TVC Condensate Pumps are low speed (1750 RPM) for long life, are easily installed (two piping connections) in areas where space is important. The cast iron receiver and sturdy pumping unit (equipped with a dirt strainer), all completely factory assembled and tested, assure a long lived trouble free installation.

Stocked by all leading jobbers

[illegible] FREMONT ST., CHICAGO 22

Get the same air delivery with only ⅓ the weight!



Model BD-43 is only 41⅝" high, delivers up to 16,500 cfm

New COOK all-aluminum belt-drive centrifugal ventilator

- Saves up to 400 lbs. on large models
- Only 6" high roof curb required
- Weatherproof aluminum shell and base
- Aluminum centrifugal wheel
- Compact belt-drive
- Low silhouette
- Non-overloading wheel, low tip speeds
- Rubber-mounted drive assembly
- From 1,000 to 16,500 cfm

The new Cook Model BD belt-drive ventilator eliminates heavy roof loads. Model BD-43, 16,500 cfm size, weighs only 250 pounds. Low tip speeds assure quiet operation. Light starting torque of the aluminum blower wheel increases bearing, motor and belt life. Are also available in Direct Drive Models from 7" to 30" sizes. Write for Catalog HV.

HINGED HOOD, motor and belt-drive easily inspected.

EASY TO CLEAN. Remove four bolts and shell lifts off.

COOK VENTILATORS
LOREN COOK COMPANY
Berea, Ohio

Cook Direct Drive Ventilators are shown in the 1955 Sweet's

Ad-Digest SERVICE

UNIT HEATERS. Inside front cover. Vertical and horizontal unit heaters are made for steam or hot water systems in 4 models, 18 sizes from 25,000 to 275,000 Btu per hr, total heat delivered. Gas-fired unit heaters are available in sizes ranging from 25,000 to 200,000 Btu per hr input. **Item 201**

FAN INFORMATION CATALOG. Page 1. A catalog describing in detail the direct way in which to exhaust fumes is offered by a fan manufacturer. The catalog gives definitions and fan laws; tells how to determine static pressure; and contains a velocity pressure table, a friction chart, and a loudness level table. Copies are available. .....**Item 202**

PROPELLER FAN AND HEATERS. Page 2. Propeller fan and unit heaters, for both steam and hot water, are available in 24 models which range in eight basic sizes with 15,000 and 335,000 Btu per hr capacities and provide 63 to 1265 sq ft. EDR basic steam ratings. Complete description and technical data are contained in an illustrated 24-page bulletin. .....**Item 203**

THERMO VALVES. Page 4. No torch, tube cutter, or sawing are required to service this manufacturer's thermo valves on a cooling system. For cleaning, repair, or capacity change, loosen two screws, raise the power element and lift out the cage. .....**Item 204**

WROUGHT IRON PIPE. Page 9. The cost of pipe, the cost of installation, and the cost of maintenance are included in a breakdown of piping system costs to show why wrought iron pipe offers maximum piping economy. A booklet giving detailed information on cost facts is available that will serve as a guide in placing pipe selection where it will profit .....**Item 205**

FLUSH VALVES. Page 11. Flush valves were selected for a new 26-story Southern office building. Seventy-six years of valve making experience has made this manufacturer's name the fastest growing in flush valves. A handbook and catalog on flush valves is available with 19 pages of installation details for exposed, concealed, and special installations. Over 75 blueprints, cutaway views, charts, formulae, and piping details are also included. .....**Item 206**

HEATING AND COOLING COILS. Page 13. To provide a greater heat transfer per sq ft of space area and lower airway resistance, these heating and cooling coils have tapered fins that can be spaced as closely as fourteen per inch. The fins make the use of high air velocities practical. Standardized encased units can be arranged for economical installations. Bulletin is available. .....**Item 207**

AUTOMATIC TEMPERATURE CONTROL. Pages 14-15. One company's automatic control systems regulate the heating and ventilating systems throughout traditional and modern religious buildings. The experience gained in these fundamental buildings in the past 80 years should be helpful in selecting the most efficient control for buildings regardless of type or size. The company's packless control valves eliminate packing maintenance and leakage of water or steam. .....**Item 208**

Below and on the following pages are given brief digests of the advertisements appearing in this month's issue. Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail the prepaid postcard to request further information from manufacturers.

The items appear in the same order as the advertisements to which they refer, to facilitate obtaining further information after reading an advtisement.

NOTE: While every attempt is made to list all advertisements, those which are received after the published closing date may not appear. The Index of Advertisers lists all the advertisements in this issue.

SELF-CLEANING AIR FILTER. Pages 16-17. Once-a-year air filter maintenance is a reality with the renewable media filtering curtain supplied in roll form. The automatic self-cleaning air filter consists of two 5-ft wide by 5-ft high sections having a total capacity of 24,700 cfm. Made of bonded glass fibers it is sufficiently resilient and flexible to permit packaging 70-ft lengths in compact 13-in. diameter rolls. Catalogs are available. .....**Item 209**

ELECTRONIC AIR FILTERS. Page 18. A filter engineer discusses how to figure the cost of electronic air filters; how to improve on a voltmeter; and air filter extras that add up to a lot. .....**Item 210**

AIR WASHERS. Page 19. A line of air washers includes six different types: humidifying and air cleaning; dehumidifying and air cleaning; humidifying and air cleaning in restricted space; humidifying with minimum pump power; dehumidifying and humidifying; and wet glass cell air washers for dust-free conditioned air. Three bulletins give the details of the complete line. .....**Item 211**

RADIANT HEATING TUBE. Page 20. Copper water tube and solder-joint fittings mean a quality radiant heating installation. Connections are leak-proof, and, because the tube comes in lengths of 80 to 100 ft, fewer fittings are required. Both the tube and fittings are available from the company's wholesalers. .....**Item 212**

FORCED DRAFT TOWERS. Page 21. A new series of cooling towers are designed so that the fan and mechanical equipment are out of the discharge air stream. Wind direction is not a factor in locating the towers because the air discharge is vertical. The towers are available in ten models for services from 3 to 50 tons. Smaller models are factory assembled and larger models are shipped disassembled. Bulletin on water cooling towers is available. .....**Item 213**

AIR CONDITIONING LINE. Page 22. Window air conditioners, packaged units from 2 to 20 tons, condensing units to 100 tons using F-12 or F-22, multi-zone units serving 2 to 8 zones, and packaged liquid chillers from 7½ to 100 tons are all available from this company's line of air conditioning equipment. Write for information on how to obtain a direct factory franchise. .....**Item 214**

HOSPITAL STEAM SUPPLY. Page 23. The steam requirements of a 281-bed hospital, which has 560 rooms, are supplied by two gas-fired boilers with a combined capacity of 41,000 lb. of steam per hour. The boilers provide the steam needed for heating, hot water, restaurant, laundry, and sterilizing requirements. Boilers such as these are available in standard sizes for loads to 40,000 lb of steam per hour at pressures to 225 psi. Write for bulletin with illustrated description of the boilers. **Item 215**

FINNED TUBE RADIATION. Page 24. Finned tube radiation units, which project only 5 in. into the room, can be installed with the fins exposed, with a snap-on metal grille, with a flat top cover, or a sloping top enclosure. Fabricated from steel tubing, the units come in two sizes and lengths of 3 to 12 ft, in one-foot increments. Information is available. .....**Item 216**

PLEASE SEND US MORE INFORMATION

Circle below Item numbers on which you wish further information.

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257	258	259	260	261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280	281	282	283	284
285	286	287	288	289	290	291	292	293	294	295	296		

PLEASE PRINT Sept. AD-55

This service available only to U. S. and Canadian readers

Name..... **Title**.....

Firm .....

Nature of Firm's Business.....

Street .....

City..... **Zone**..... **State**.....

This card is void after Dec. 1, 1955

Circle numbers corresponding to the advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

Ad-Digest SERVICE

DRAFT CONTROLS. Page 26. Draft controls for coal and oil fired heating plants are heavy duty, commercial models in 20 and 22-in. sizes. They are also available in 6 to 24-in. sizes for domestic and commercial installations. Controls for gas and gas-oil fired heating plants are made in sizes 8 through 32-in. for commercial and industrial installations. .....Item 217

WELDING FITTINGS. Page 27. Welding fittings and flanges, made by one manufacturer, meet all American Standard and Safety Code requirements. The company offers engineering service, advanced products, and a complete line of welding fittings and flanges. .....Item 218

HEATING SYSTEMS. Page 28. These heating systems are available in five types with or without automatic control for institutional, commercial and public buildings. The system, with single dial control, tunes in with the weather to balance heat supply against heat loss. .....Item 219

PIPE INSULATION. Page 30. One-piece, glass fiber pipe insulation can insulate a 6-ft section of pipe on large or small, hot or chilled piping. The lightweight insulation can be used to insulate piping up to 23 in. in diameter, where temperatures do not exceed 350 deg F. Samples and technical bulletin are available.....Item 220

FAN COOLERS. Page 30. Eliminate water problems by using fan coolers for any size compressor, regardless of tonnage. Stands, hoods, and wind deflectors are available for simplified outside mounting. Bulletin available. .....Item 221

RADIANT PANEL HEATING. Page 31. Radiant panel heating offers several advantages to the heating contractor, such as a low installation cost, no heat damage, easy installation, and customer satisfaction. The coils are made of heavy aluminum fins bonded to ⅝-in. OD copper tube. Bulletin on radiant panel heating is available. .....Item 222

SNOW REMOVAL SYSTEMS. Page 32. Steel pipe snow and ice removal systems are not just a convenience but a competitive advantage for commercial establishments selling to the public. Steel pipe has a performance record proved more than 60 years in hot water and steam heating applications. A 32-page booklet on snow melting and ice removal systems is available. .....Item 223

COPPER TUBE AND FITTINGS. Page 33. Copper tube and fittings helped to turn a landmark into a modern, comfortable office building. The contractor could run lines through small openings and inside existing partitions; the 20-ft lengths reduced the number of fittings and the elimination of pipe-threading was a big time saver. Additional time was saved by prefabricating assemblies at the shop. Information on copper tube and fittings is available. .....Item 224

HEATING PUMPS. Page 36. In a heating pump, silence is golden. This line of heating pumps includes a size for every type of heating job, including vacuum and boiler feed pumps and condensation pumps and receivers. Bulletins for each pump in the line are available. .....Item 225

MULTI-ZONE COOLING UNITS. Page 37. Multi-zone air conditioning units blend air mixtures for simultaneous unequal cooling loads and serve up to 12 separate zones. The units are of blow-through type with divided outlets to serve multiple zones by supplying heated or cooled air, or controlled mixtures of both. Information about multi-zone air conditioning is available. .....Item 226

SHOWER MIXING VALVES. Page 38. Valve, stops, and checks with strainers are concealed behind the dial plate of these mixing valves, yet are readily accessible. Exposed parts are finished in polished chrome, and internal sliding parts are made of stainless steel. .....Item 227

MOTOR-COMPRESSOR UNITS. Page 39. Cool-running two-cylinder, motor-compressor units for refrigeration and air conditioning products are available in Freon-12 and Freon-22 models and in sizes from 1/3 to 1½ hp. .....Item 228

TOTALLY ENCLOSED MOTORS. Page 43. A line of totally enclosed motors is more compact and lighter by using modern materials and new insulation that permits the manufacturer to build smaller motors that do more work for their size and weight. A compact size and lightness make the motors easier to handle and install. Motors are also available built to former NEMA standards. .....Item 229

INDUSTRIAL HEATING SUPPLIES. Pages 44-45. One source of supply for industrial heating needs includes diffusers for any heating pattern; heaters for large areas; unit heaters for doorways; finned tubing for beneath windows; convectors for wall-to-wall heating; fans and coils for built-up systems; and traps, valves, and vents for saving fuel. .....Item 230

INDUSTRIAL FUEL BURNING. Pages 45-46. Industrial fuel burning systems are coordinated by panel boards with controls housed in steel cabinets. The heart of the systems is a horizontal, rotary oil burner that is designed for operation with light or heavy oil, or gas, or both. Wind-box assemblies provide the necessary air control. A 12-page booklet describing the systems is available. .....Item 231

CEILING DIFFUSERS. Page 50. Square and rectangular ceiling diffusers, available in all air distribution patterns, are made three-way, two-way, one-way, and two-way corner. The opposed blade damper, when installed directly into the ceiling plate, becomes an integral part of the diffuser. Diffuser information is available. .....Item 232

AIR CONDITIONERS. Page 51. Style is a vital consideration in building air conditioners. The features of these functionally styled air conditioners include an accessible hermetic compressor, an oversize variflow blower, a vertical cooling coil, and a pump-down control system. Descriptive literature is available. .....Item 233

ANSWERS TO PIPE PROBLEMS. Page 52. Look under this company's name in the alphabetical or classified phone books for its 28 conveniently located district sales offices maintained across the country. The offices are staffed by men who are specialists in steel, who know pipe, and who understand pipe problems. Contact the company's pipe distributor for help in solving pipe problems. .....Item 234

PLANT AIR CONDITIONING. Page 54. A jet aircraft assembly plant was so soundproofed that it had to be air conditioned to exhaust heat, fumes, and stale air. The system is built around supply and exhaust fans, air conditioning units, sprayed coil dehumidifiers, heating and cooling coils, vaneaxial fans, unit heaters, and necessary accessories. The company's engineers are familiar with industrial air-handling and air conditioning problems. Assistance or technical data is available. .....Item 235

VERTICAL PUMP. Page 55. Vertical pumps are made in either single or duplex units. The duplex units are built with either the two float switches or automatic alternator. They are available in a capacity range from 500 to 10,000 sq ft EDR and discharge pressures from 10 to 40 lb. A bulletin with engineering data and capacity tables is available. .....Item 236

SOLENOID MOTOR CONTROL. Page 56. Solenoid motor controls for air conditioning and refrigeration are a sound investment because their silver alloy contacts need no maintenance. Thirteen bulletins are available describing this line of solenoid motor controls. .....Item 237

POWER FASTENING TOOL. Page 57. Ventilating duct hangers can be fastened quick and sure with a cartridge-powered fastening tool. The tool has a snap-open action, requires only one standard power load, has automatic cartridge extraction, has a steel encased rubber guard, a barrel extension, and is UL approved. Catalog is available. .....Item 238

STEAM BOILERS. Page 58. Two stoker-fired boilers were installed by one midwest company in its warehouse in 1928. The company has preferred these boilers for its new buildings as it expanded because the boilers are rated on nominal capacity and will deliver steam beyond average daily requirements. .....Item 239

FRESH AIR MANUFACTURERS. Page 59. Air recovery units that use activated carbon to manufacture fresh air eliminated the need for two large ducts in a skyscraper; cut the required air intake in half in another building; and reduced the required boiler capacity of a large industrial plant. Let the company show you how you can improve your air conditioning and ventilating layouts. Write for complete information. .....Item 240

TEMPERATURE REGULATORS. Page 60. These regulators are guaranteed to shut tight when the demand for steam ceases. Expensive steam leaks due to a lack of tight shutoff are eliminated. Bulletin available. .....Item 241

BOILER-BURNER UNITS. Page 61. Integrated boiler-burner units, with forced draft firing, require only four field connections to put them in service; fuel, water, steam, and electricity. The dual fuel burner can burn either gas or oil and switch from one fuel to another at a moment's notice. The forced draft firing system is a complete package in itself. Detailed information on the units is available. .....Item 242

INDUSTRIAL FLUID HEATERS. Page 62. Industrial and commercial fluid heating requirements can be answered by these heat exchangers. The line includes instantaneous water heaters, 34 sizes of steam-to-water converters, 20 sizes of water-to-water converters, 5 types of fuel oil heaters, and 34 sizes of tank heating units. Heat exchanger catalogs are available. .....Item 243

Postage Will be paid by Addressee

No Postage Stamp Necessary If Mailed in the U.S.

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 36, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

AIR CONDITIONING, HEATING AND VENTILATING

93 WORTH STREET

NEW YORK 13, N. Y.

AD-DIGEST SERVICE

FANS AND BLOWERS. Page 63. The manufacturer of these fans and blowers builds its own motors and matches them to meet blower requirements. The backward curve, belt drive, utility blowers in sizes from 12½ to 36½ inches meet NAFM recommendations. Two bulletins are available giving the performance data of the fans and forward and backward curve blowers; dimension prints are also available. Item 246

GLASS BANK IS AIR CONDITIONED. Page 65. Two 150-ton packaged water chillers, of this company, were installed in the basement of a bank made with the largest panes of glass ever made in the country. The two water chillers handle the entire cooling for the new bank. They circulate water to a central air distribution system, from there cool, filtered, dehumidified air is sent throughout the building. .....Item 245

PROPELLER FANS. Page 67. Propeller type ventilating fans deliver large volumes of air at low resistance and low current consumption. Made in 2 types and 10 basic sizes to cover a wide range of industrial applications. Wheel diameters from 16-in. to 49-in.; direct or belted drive; and capacities from 610 cfm to 24,200 cfm. Bulletins are available. .....Item 246

PACKAGED AIR CONDITIONING. Page 68. A packaged air conditioning dealer sells more units because he gets help from his distributor; because he represents the manufacturer's name; because he's backed by national advertising; and because of the air conditioner's features. Air-cooled units are available in 2, 3, 5, and 7½ hp. Water-cooled units are available in six models from 2 to 15 hp. Details on dealer franchise are available. .....Item 247

STEAM LINE INSULATION. Page 69. Three men installed 115 ft of 5-in. and 1¼-in. pipe for steam lines and returns into a new 16-classroom building. The installation was made in a trench 6 ft deep and took a total of 24 man-hours. The insulation forms three zones of protection; needs no housing or mechanical sheath; and is available for 3 different temperature ranges. Information is available. Item 248

AIR FILTERS. Page 70. Substitute air filters mean contributions to the junk pile and higher cost. Get air filters that handle more air with a greater dirt-holding capacity. These filters with their heavier frames, reinforcing rods, and other features insure that each unit will continue to operate with replacements virtually eliminated. Complete catalog information is available. .....Item 249

HEAT PUMP CONTROLS. Page 71. Precision control of a reversed cycle heat pump, utilizing two 40-ton refrigeration compressors, in a library building is provided by a specially engineered system of automatic temperature control. Strategically located heating-cooling thermostats maintain even temperatures throughout each of nine zones. Valves and related apparatus keep the system in balance with outdoor temperatures. Engineering recommendations are available. .....Item 250

FRACTIONAL HP MOTORS. Page 72. Smaller, more compact capacitor-start and split-phase, fractional-hp motors have added features such as a new endplate design, a new lubrication system that permits all-angle mounting and a new terminal board and switch location. A wide variety of types and sizes, single phase or polyphase, are made from 1/25 to 400 hp. Motor bulletin is available. .....Item 251

FIREBOX BOILERS. Page 73. Firebox boilers for heating big buildings everywhere make, from an engineering standpoint, an efficient installation with simple operation and maintenance. From an operating or owner point of view, their fuel economy makes them attractive. Bulletin giving boiler information is available. .....Item 252

COPPER WATER TUBE. Page 117. A low-cost apartment house project of 64 buildings had 200,000 ft of copper water tube installed for plumbing and heating lines. The copper water tube was preferred because it is easy to bend; it comes in handy lengths; it can be installed with solder or compression fittings; and it does not rust. Technical advisory service is available. .....Item 253

COOLING TOWERS. Page 119. These cooling towers have a 20-year guarantee on the wetted deck surface against rotting or fungus attack. Equipped with stainless steel fans, the towers are available in capacities from 3 to 120 tons. Matching condensers for the towers are available in capacities from 1/3 to 25 tons. Write for detailed specifications. .....Item 254

VALVE TESTING. Page 121. Testing for product performance values is an old custom with one valve manufacturer. The valve testing is done in both field and laboratory by scientific techniques. The testing work seeks to increase valve performance and lessen maintenance needs. .....Item 255

WATER HEATERS. Page 125. This copper-lined heater is a complete copper heater built inside of a heavy steel shell. It combines non-corrosive properties of copper with the superior strength of steel. Catalog available. .....Item 256

ELECTRIC - ELECTRONIC CONTROLS. Page 127. Electric-electronic controls in control centers maintain desired temperature levels in the 150 rooms of a power company's new office. Each of the eight zones has its own control system. Outdoor reset controls position motor-operated valves, and averaging type thermostats actuate an averaging control that positions mixing dampers. Data, prices, and information on automatic control problems are available. .....Item 257

GALVANIZED SHEETS. Page 129. Ductile and tight-coated galvanized sheet is made for furnace pipe, snap lock or closed seam perimeter heating or air conditioning pipe, and accessories. The coating will not crack or flake and will take anything the base metal will. .....Item 258

UNIT HEATER LINES. Page 131. Horizontal unit heaters are built in 21 standard and low outlet temperature steam models and 5 hot water models. Verticals are available in 26 models, 13 sizes for steam and hot water. All models discharge air temperatures in 110 to 120 deg F range. Unit heater booklet is available. Item 259

JET COOLER MOTORS. Page 133. Ceiling jet unit coolers for maintaining continuous low temperatures in cold storage rooms call for reliable motor operation, usually in the presence of high humidity. This company's 1/10-hp, 1140-rpm, Type C, permanent split capacitor motor was selected for the job. The unusual method for mounting the capacitor provided the answer. Assistance offered for unusual motor problems. .....Item 260

REFRIGERATION CONDENSERS. Page 135. Refrigeration condensers have three features which save trouble and money in running a refrigeration plant: one keeps scale and salts from crusting the coils; another removes oil and dirt from the refrigerant; and the third gives automatic operation at minimum head pressure. Nearby installations are open for inspection. Bulletin is available. .....Item 261

CUT PIPING LAYOUT COSTS. Page 135. A pipe fabrication service can save time, material, and labor costs by eliminating numerous flanged joints and combining several fittings into one integral unit. All types of materials are fabricated according to buyer's specifications, in sizes from 3 to 44 in. in diameter and thicknesses to ⅝-in. Bulletin available. .....Item 262

COOLING TOWERS. Page 135. Modern forced draft, low silhouette cooling towers have a dry blower air propulsion system. High cooling efficiency is obtained by a thorough water breakup from the manufacturers nozzles. Heavily galvanized, the interior surfaces of the towers are sprayed with a mastic coating. Information on the complete line of natural and mechanical draft cooling towers is available. Item 263

INTERIOR FIRE-PROTECTION. Page 137. Standpipes are judged on trade-preference, number of installations, sales volume, selection of items, pricing, and delivery. .....Item 264

DRAFT INDUCERS. Page 137. Install a motorized draft inducer to end draft troubles. A draft inducer eliminates the troubles due to cold chimney after shutdown; smoke, soot, or gases due to poor draft; or low carbon dioxide resulting in high fuel bills. Bulletin on draft inducers is available. .....Item 265

GAS UNIT HEATING. Page 139. Gas unit heating offers adaptability to future construction; ease of installation; response to changes in temperature; low initial cost; savings on valuable floor space; and extra heat for trouble spots. Catalog and other information is available. .....Item 266

ROOF VENTILATORS. Page 139. Industrial and commercial roof ventilators were installed in a new locker room of a Municipal Stadium to exhaust warm, moist air quietly. Many industrial and commercial ventilation problems are solved by these ventilators. Ventilation literature is available. .....Item 267

VENTILATORS. Page 140. This company's ventilators are made in both blower or propeller types. The units are easy to install, are all aluminum, have a low silhouette, and their motor is sealed from the air stream. Catalog available. Item 268

CONDENSATE PUMPS. Page 140. Condensate pumps for low pressure systems are made in single units with the 21-in. diameter receiver and a return height of 6⅝ in. above the floor; the duplex units have 25½-in. height diameter receivers and a return height of 7¼ in. above the floor. The low speed (1750 rpm) pumps have capacities from 500 to 20,000 sq. ft. EDR and up to 30 lb discharge pressure. Condensate pump bulletin is available. Item 269

SHEET METAL TOOLS. Page 140. One manufacturer of sheet metal tools will bring into a shop and demonstrate tools for shearing, nibbling, and cutting. The tools cut cleanly and without distortion. .....Item 270

Use this digest to locate and refer to advertisements appearing in this issue of AIR CONDITIONING, HEATING AND VENTILATING, then fill out and mail the prepaid postcard to request further information.

Circle numbers corresponding to the advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

PLEASE SEND US MORE INFORMATION

Circle below item numbers on which you wish further information.

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285	286	287	288	289	290	291	292	293	294	295	296		

PLEASE PRINT Sept. AD-55

This service available only to U. S. and Canadian readers

Name..... **Title**.....

Firm .....

Nature of Firm's Business.....

Street .....

City..... **Zone**..... **State**.....

This card is void after Dec. 1, 1955

Ad-Digest SERVICE

BOILER WATER LEVEL CONTROLS. Page 145. A permanent Alnico magnet, located outside the float chamber, links boiler water level and electrical controls. The brass float chamber liner is self-cleaning. The controls are available for temperatures up to 750 deg F, at pressures up to 900 psi for single stage or multi-level stage. Special units are also available. Catalog section and information are available. .....Item 271

EVAPORATIVE CONDENSERS. Page 145. Evaporative condensers with water-air control attachments automatically cut overall plant operating costs. The patented system shuts off the water, and later the fan, when not required. These and other advantages are performed automatically, saving time and labor. Information on the condensers is available. .....Item 272

VIBRATION CONTROL. Page 146. Twin rail bases control vibration of fans and motors to keep noise and vibration from reaching working areas through steel deck or through air conditioning ducts. For vibration control on fans, pumps, compressors, refrigerating and other types of mechanical equipment in both normal and critical operating service. Basic isolation recommendations are given in a bulletin. .....Item 273

THIN CORE GRILLES. Page 147. Grilles designed specifically for thin doors and partitions from ¼ to ⅝ in. thick do not require the addition of wood moldings. They have a telescoping auxiliary frame that fastens to the grille with posts and screws. A catalog listing over 1000 types and sizes of grilles is available....Item 275

HEAVY OIL HEATER. Page 147. Good oil heaters are needed for moving heavy fuel oils. These oil heaters are made for any application requiring heating for burning or bulk movement of oil. They are suitable for heating the oil with hot water or steam. Catalog available. .....Item 276

LINE OF AIR DIFFUSERS. Page 148. Air diffusers for every application in this manufacturer's line include: cooling, cooling and heating, supply and return, half-round, rectangular, and square. The diffusers are adjustable, for air volume and diffusion pattern. Air diffuser catalog is available. .....Item 276

INDUSTRIAL HEATERS. Page 149. Industrial heaters are made for space heating, tempering, make-up air, curing, drying or de-icing. The line includes 6 models, 66 sizes, and vertical and horizontal units with capacities from 300,000 to 2,000,000 Btu per hr. Information and specifications are available. .....Item 277

CONDENSATE WATER REMOVER. Page 149. An automatic unit will remove hot or cold condensate fluids from the receiver tank and pump it to an outside drain or back into the equipment. It can be installed with air conditioning equipment and has an approximate centrifugal pump delivery of 4½ gpm. It measures 5¾ in. wide, 10 in. long, and 11¾ in. high. .....Item 278

REGISTERS AND GRILLES. Page 150. Adjustable registers and grilles are streamlined for appearance and operating efficiency, including fins, damper blades, and radius edges of the solid frame. The line includes stamped grilles, adjustable heating-cooling models, air directors, mounting frames, fusible links, door grilles, and various accessories. Catalog is available. .....Item 279

POWER ROOF VENTILATORS. Page 151. Power roof ventilators have advanced modern design to fulfill architectural styling and job performance requirements. The ventilators are made with air capacities from 500 to 30,000 cfm and with belt or direct drives. A booklet is available that gives the design, construction, and performance data of the ventilators. .....Item 280

OUTDOOR TEMPERATURE CONTROL. Page 151. An outdoor temperature control can select the comfort hours desired and automatically reset itself as the weather changes. The time switch stops heat input to the building when outdoor temperatures rise above adjustable pre-selected temperatures and eliminates night setback in extreme cold weather. Bulletin is available. .....Item 281

STRIP AIR DIFFUSERS. Page 151. Installed as a continuous strip in window head or sill, a strip air diffuser is a practical means for air curtaining plate glass windows or wall areas to counteract summer heat or winter chill. Available as a continuous unit or in sections to meet interior requirements, the diffuser may be used in shallow lighting coves or with continuous lighting fixtures. .....Item 282

ELECTRIC BASEBOARD HEATERS. Page 152. Located along outside walls, electric baseboard heaters provide perimeter heating through a combination of radiant and convected heat. A baseboard requires only two screws to hold it, two wires to connect it, and can be painted to match walls. A bulletin with information on selecting, installing, and controlling electric baseboard heaters is available. .....Item 283

FAN AND GRAVITY VENTILATORS. Page 153. Fifteen 36-in ventilators in an industrial valve company's iron and bronze foundry and eleven 36-in. units in its brass foundry change the air every 3½ min. Located in a valley with no natural air movement, the foundry's other buildings are ventilated by exhaust fans spaced 60 in. apart. The air in these buildings is changed every 4½ to 5 min. Roof ventilator data book is available. .....Item 284

CEILING AIR DIFFUSERS. Page 153. These ceiling air diffusers provide full dimension heating and air conditioning comfort. They are made in five flush and five extended models, sized for 6- to 14-in. ducts with a baked-on metallic finish. Write on letterhead for free literature. ...Item 285

CABINET UNIT HEATERS. Page 154. Thorough engineering research preceded the manufacture of these cabinet unit heaters. Alternative features and designs were analyzed from the standpoint of proved practicality and efficiency. Complete information on the cabinet unit heaters is available. .....Item 286

FLEXIBLE HOSE. Page 155. Flexible hose for dust or chip collection, fume control, or ventilation is available in 1¼ to 36 in. ID. Made of Neoprene-impregnated cotton or Nylon, the hose can be bent to conform to any installation requirement. Bulletins giving data on flow characteristics, installation procedure, sizes, and prices are available. .....Item 287

AUTOMATIC SHUTTER. Page 155. An automatic shutter for unit blowers is self-contained in an adapter sleeve for attachment to the blower. Weather stripped, the shutter has light gage aluminum louvers with felt silencer strips. Catalog, circular, and prices are available. .....Item 288

COMMERCIAL-INDUSTRIAL BURNERS. Page 155. Six new gas and gas-oil fired burners are available for commercial and instrustrial heating. The burners are made for gas only; combination light oil (No. 2) and gas; and combination heavy oil (No. 5) and gas. The six models range in capacity from 720,000 to 8,600,000 Btu per hr. Complete information and prices are available. .....Item 289

AUTOMATIC BOILERS. Page 156. Packaged steam generators save production time and maintenance dollars and stay efficient for a long time. Used for high or low pressure steam and for hot water applications the boilers are automatic, range from 20 to 500 hp and can be gas, oil, or combination fired. Bulletins are available. .....Item 290

GAS-FIRED UNIT HEATERS. Page 157. Advantages of these gas-fired unit heaters includes rust- and corrosion-resistant stainless steel burners as standard equipment; a choice of aluminized or stainless steel heat exchangers; light weight; self-cleaning burner ports; and hinged casing which swings down for inspection or service. Selection and application data are available in a 12-page bulletin. Item 291

MIDGET SIZE UNIT HEATER. Page 158. A gas-fired unit heater, which is 23 in. high, is a propeller-fan type with a capacity of 50,000 to 70,000 Btu per hr input according to the fan motor size. It has a 16-gage aluminized steel heat exchanger, and is made in 6 additional sizes. The company manufactures a gas-fired line of propeller fan and duct model heaters ranging up to 120,000 Btu per hr capacity. A 12-page folder on the gas-fired unit heaters is available. .....Item 292

DUCT FANS. Page 159. These fans are easily installed units for high efficiency air movement in all duct systems. Direct driven types for atmosphere within safe motor operating limits or belted models for hazardous fumes, vapors, and excessive temperatures are available. Capacities to 120,000 cfm. Folder available. .....Item 293

UNIT COOLER. Page 159. A ceiling-type cooler for food processing and storage is designed especially to conserve space, maintain proper temperature, produce even air motion, and reduce shrinkage. Folder available. .....Item 294

DAMPER CONTROL. Page 159. Damper controls provide the four control features essential to safe, efficient operation of induced draft installations. The four features are a starting draft selector; automatic draft modulation; automatic sequence operation; and low draft cutoff. Complete information is available. .....Item 295

SWITCHES AND VALVES. Back cover. A manufacturer of liquid level controls also makes a flow switch to start or stop a pump, alarm or meter when a flow of liquid starts or stops; an explosion proof electric controller for use under hazardous conditions; and a float valve for hundreds of liquid level control jobs. A new 24-page catalog is available. .....Item 296

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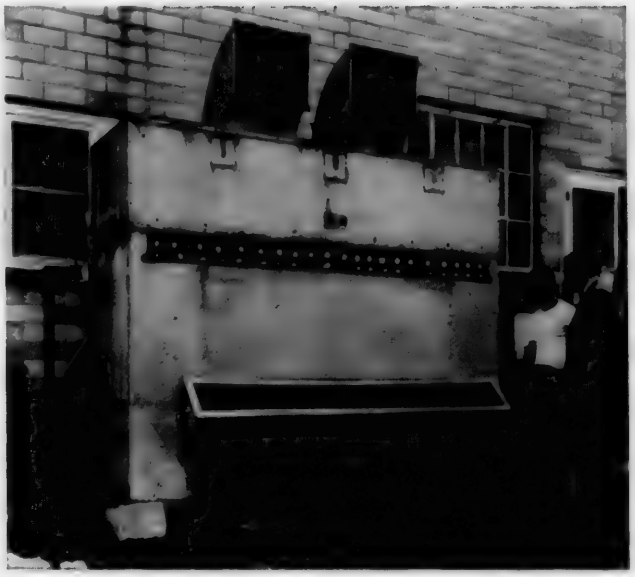
FIRST CLASS PERMIT NO. 33, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

AIR CONDITIONING, HEATING AND VENTILATING

93 WORTH STREET

NEW YORK 13, N. Y.

AD-DIGEST SERVICE



Operate Your Evaporative Condensers This Better Way

FRICK evaporative condensers with super-saving water-air control attachments automatically cut overall plant operating costs.

If you want to save water, save power, and save labor; if you must avoid freeze-ups in winter, and bothersome changes in head pressure the year 'round; if your refrigerating plant runs at times without an engineer—then you need the Frick-Mollenberg automatic condenser super-saving control.

This patented system shuts off the water, and later the fan, when not required. It utilizes water from the compressor jackets. It handles overloads, or pump failure, with fresh water. Water lines are drained in cold weather. Flooding or starving of coolers and coils from fluctuating feed pressures are stopped. These and other advantages are performed automatically, saving time and labor.

Only Frick Company is licensed to furnish these valuable features. Before buying any evaporative condenser, ask how this super-saving control can reduce operating expenses in YOUR plant. The Waynesboro, Penna., Office or a nearby Frick Branch Office will give you detailed information without obligation. Write, wire or phone.

DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

WAYNESBORO, PENNA. U.S.A.

These Condensers Are Among Many in Buffalo Equipped With Frick-Mollenberg Super-saving Control.

Safer because It's Simpler

■ Of all boiler water level controls, we believe Magnetrol to be the safest. Certainly it is the simplest.

A PERMANENT Alnico magnet, located *outside* the float chamber, links boiler water level and electrical controls. This infallible magnetic link eliminates mechanical parts normally subject to wear and fatigue failure. *Pioneered and perfected by Magnetrol,* it provides almost unlimited operating life.

The brass "No-Scale" float chamber liner, another exclusive Magnetrol feature, is self-cleaning. It actually "flexes" off scale and prevents "sticking" of the float.

A magnetic sleeve, raised and lowered within a non-magnetic tube, "trips" or releases an Alnico permanent magnet attached to a mercury switch. Basically, this is Magnetrol.

These are just two of *many* advances for greater boiler safety found *only* in Magnetrol. *Standard* Magnetrol units are available for temperatures up to 750°F., at pressures up to 600 psi, for single stage (low water cut-off) or multi-level stage (pump control *plus* low water cutoff and alarm) service with as many as three separate switching actions. Special units are available for more extreme requirements.

MAGNETROL, Inc.

Mail the Coupon Now for the Facts

MAGNETROL, INC., 2106 S. Marshall Blvd., Chicago 23, Ill.
Gentlemen: Please send me Catalog Section III and full information on Magnetrol Boiler Water Level Controls.

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Company_____

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STOP VIBRATION

with KORFUND VIBRATION CONTROL

The photograph shows five of a total installation of 324 Clarage Heavy Duty Fans at The Upjohn Company's new pharmaceutical plant at Kalamazoo, Mich.

Korfund Twin Rail Bases under each fan and motor keep noise and vibration from reaching working areas through the steel deck or through the air conditioning ducts, and make possible this simple, space-saving installation on suspended platforms and structural steel members under the roof.

Korfund Duplex Twin Rail Bases have separate rails for fan and motor, and are completely adjustable—on the job—to take care of any drive center distance, motor position, bolt location or other variables. Built-in chocks assure positive alignment. Light weight, they are easier to handle. Base Drawings are immediately available for most fans and motors. And, because of standardization, long production runs reduce cost and permit quick deliveries.

For installation of fans, pumps, compressors, refrigerating and other types of mechanical equipment for both normal and critical operating conditions, basic isolation recommendations are given in Bulletin No. 15. Write for your free copy today, or see our catalog in Sweet's Files. Write, too, for one of our free Belt-Center Distance Calculators—it's a real time saver.

If you have a specific problem, we will be glad to submit recommendations without obligation. A half century of experience is at your disposal. Representatives in principal cities.

THE KORFUND CO., INC.

48-01 E. Thirty Second Place, Long Island City 1, N. Y.
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Methods of Joining Plastic Pipe

(*Concluded from page* 76)

The gas utilities in recent years have used substantial quantities of plastic pipe in service installations and, in some instances, mains. Compression couplings, with internal metal back-up rings, have been quite generally used in this application.

Compression couplings of plastic for polyethylene pipe use have been developed and are available. They have not as yet had wide acceptance and use.

Thermopiastic material can be readily fabricated and many pipe manufacturers offer a wide variety of standard and special fabricated fittings. This is very advantageous to the industry on specialty items for which there is no great demand. Molds are expensive and many such items would be prohibitive in price if they had to be molded.

Plastic valves are also being designed and developed. This will permit complete plastic piping systems. Such valves are designed for direct connection to plastic pipe and further expand its use.

Plastic pipe will probably always be designed for specific applications using the most suitable material and dimensions. Fittings will and can be made to conform. To date, conventional fitting design has been used by the industry and with good results. It is to be expected, however, in such a dynamic young industry that unique and better fitting designs and techniques of joining will be developed.

NEWS OF THE MONTH

CONTROL RESEARCH

(*Continued from page* 138)

enable it, for example, to repeat the same weather conditions every day of a 60-day simulated period in only one second of actual time—a time factor of approximately 5,000,000 to 1.

The analog is but one of many laboratory aides used by the heat transfer group to increase human comfort by gaining more knowledge of the application of external heating or cooling to the human body. The group's studies also include the effect of heat on controls, motors and actuators, computers, and many other mechanical and electrical devices built for industry, aviation and many other fields.

• **CLIMATE BOX.**—As part of its heat transfer program, an environmental chamber has been built in which air temperatures can be maintained from 0 to 150 deg F, mean radiant temperatures from 0 to 150 deg, air velocities from 0 to 150 feet per second and relative humidities from 10 to 90%. In this unique chamber simultaneous readings can be taken every second to show the research scientist the responses of thermostats and other control devices under various conditions of humidity, relative

(*Continued on page* 148)

- CUTS INSTALLATION TIME OVER ½!
- EASY TO INSTALL *Anyone Can Do It!*
- COMPLETE—NO WOOD MOLDINGS TO ADD!

NEW! THIN CORE GRILLE FOR DOORS—PARTITIONS 1/4" to 3/4" THICK!

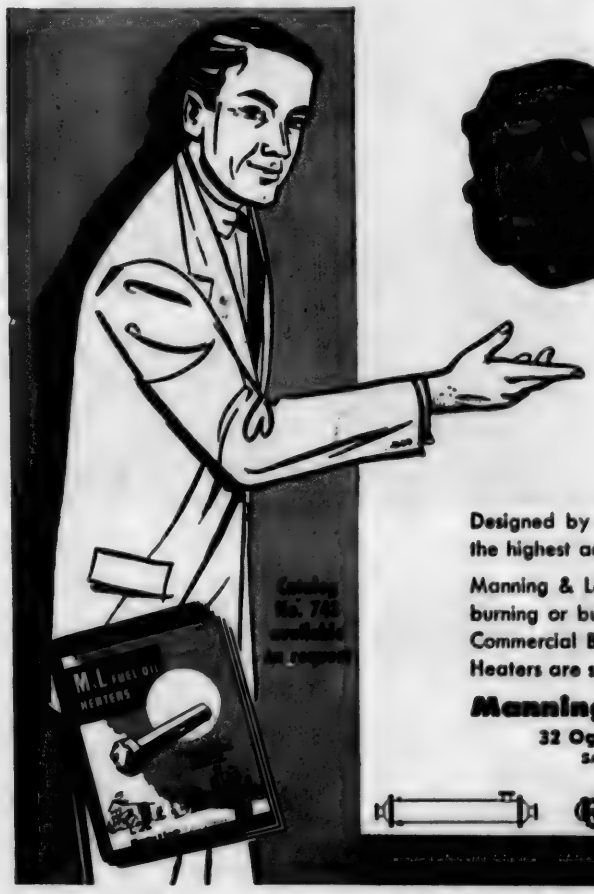
First Grille ever designed specifically for thin doors and partitions. Anyone can install it in just a few minutes time. No close tolerances required . . . almost a half-inch extra on sides for positioning. Telescoping auxiliary frame fastens to grille with posts and screws. Clamps tight. No holes to position. Practically no danger of ruining door. No wood moldings. All steel. Rattle-proof. No vision, with 80% free area. Available with or without frame, all sizes. Gray or tan prime coated, or Hammertone finish in gray or bronze.

ACTUAL SIZE Cross Section

WRITE FOR OUR COMPLETE
FREE CATALOG
Listing Over 1,000 Types and Sizes of Grilles for Every Requirement

A-J MANUFACTURING CO.

Dept. V-9 - 2119 Washington St. - Kansas City, Mo.



Safety Heater approved by Board of Standards and Appeals—N.Y. City No. 832-52-SA

You Need a Good Oil Heater for Burning or Moving Heavy Fuel Oil!

Designed by expert oil heating engineers and manufactured in accordance with the highest accepted standards for materials and construction.

Manning & Lewis build fuel oil heaters for any application requiring heating for burning or bulk movement such as Power Plants—Hospitals—Apartment Houses—Commercial Buildings—Bulk Distribution Stations and Storage Tanks—All M&L Oil Heaters are suitable for heating the oil with hot water or steam.

Manning & Lewis Engineering Co.
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FLEXIFLO
The Diffuser for Every Application
Here's the complete diffuser line with all extra features: built-in equalizing deflectors; easy to install; quick adjustment of air volume and diffusion pattern; simplified engineering; beautifully finished in any color baked enamel.
Let our sales engineers show you why Flexiflo is better for your jobs. But first — get the Flexiflo catalog.
Type R, constant flow pattern regardless of volume adjustment.
Type V, fully adjustable air diffusion pattern and volume.
Type MP, for 1-, 2-, 3- or 4-way diffusion to accommodate any shaped area, 16 styles.
Type CH, adjustable for heating, ventilating and cooling.
Type H, adjustable volume, constant pattern and radius of diffusion.
Type S, side wall or ceiling, with Type R or V blades for heating or cooling.
Return this coupon
UNIVERSAL DIFFUSER CORP.
1360 GARRISON AVE. NEW YORK 59, N.Y.

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NAME_____

COMPANY_____

STREET_____

CITY_____ ZONE____ STATE_____

CONTROL RESEARCH

(*Continued from page* 146)

humidity, pressure, radiant and ambient temperature, and at various thermostat cycling speeds. Use of fast-acting thermocouples or thermistors, venturi tubes and electronic, hair hygrometer or carbon humidity sensing elements enables him to obtain accurate data on these phenomena simultaneously at a variety of points in the test chamber.

• **HUMIDITY.**—Allied with this attack on man's dissatisfaction with his own comfort is the related study of humidity. However, since it has also had widespread and sometimes effects on the operation of many industries, businesses and even agriculture, Honeywell's humidity studies range from investigation of its effect on comfort to improvements in the measurement of moisture surrounding "moth-balled" military equipment.

From these studies has come one of the most sensitive humidity sensing elements known today. It is a small square of plastic on which is embossed a printed circuit of hygroscopic salt. It is so sensitive that a teaspoon of water in an ordinary room will change the circuit's electrical resistance.

Effect of mean radiant temperature on human comfort is studied by M-H research scientist using two-sphere radiometer built in the company's Research Center.

Originally designed for improving humidity controls for homes and commercial buildings, the tiny device has now been adapted to moisture control in tobacco curing and grain drying, detection of rust-producing moisture in stored materials, and to the precise control of moisture in solvents used in commercial dry cleaning.

Good as it is, the search for something better continues. These elements, and others including new carbon types—undergo special aging tests under various tem-

(*Continued on page* 150)

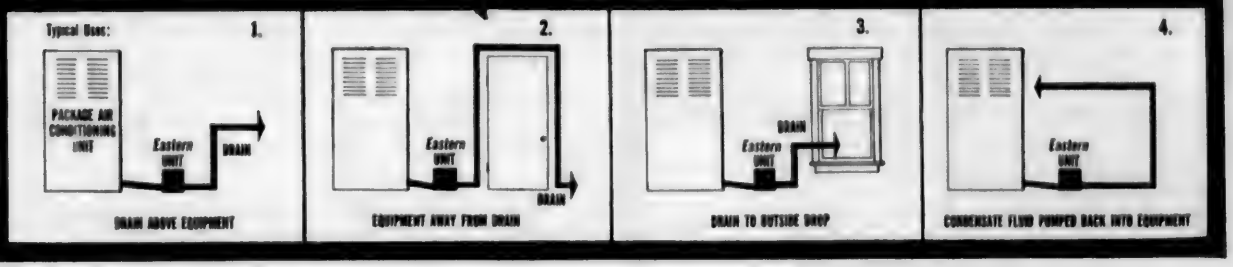
REMOVE CONDENSATE WATER

FROM AIR CONDITIONING SYSTEMS

A completely automatic, foolproof unit designed to remove hot or cold condensate fluids from the receiver tank and pump it to an outside drain. Simple to install with air conditioning equipment, it gives quiet and reliable performance.

Eastern Model 3, Type 100: Tank capacity 0.8 gallon. Centrifugal pump delivery approximately 4½ GPM at 0 P.S.I. and shut off of 12½ P.S.I. Motor 1/40 H.P., 115 volt. Weight 23 pounds. Mercury control switch. Size 5⅛ inches wide, 10 inches long, 11¾ inches high.

EASTERN INDUSTRIES, INCORPORATED
100 SKIFF STREET, HAMDEN, CONN.



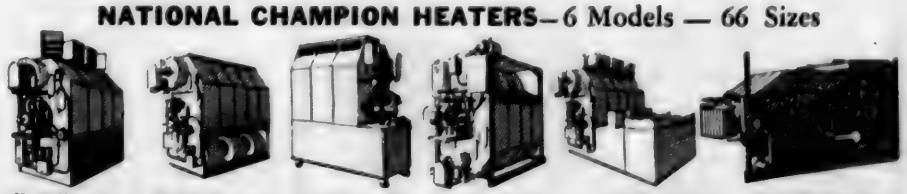
National Champion

GIVES BIG LEAGUE PERFORMANCE!

Drive your heating problem "over the fence" with National Champion Heaters! Whatever your heating need—space heating, tempering, make-up air, curing, drying or de-icing—there's a National Champion to do the job. Check these winning points:

- 80% guaranteed heating efficiency
- Direct fired for gas, oil or combination fuels
- Completely automatic controls — for constant, clean heat
- 70%-150% more heat transfer area than similar units
- Quieter, smoother operation — lowest blower RPM
- Highest available external static pressures
- Electronic flame failure control
- Completely wired, assembled and flame-tested at the factory to guarantee peak performance
- Listing by Underwriters' Laboratories, Inc.

NATIONAL CHAMPION HEATERS—6 Models — 66 Sizes



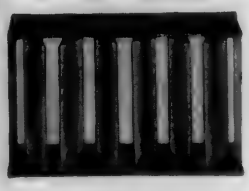
Model M — vertical unit with discharge hoods 17 sizes.
Model D — vertical unit for duct work. 12 sizes.
Model P — portable, vertical unit for flexible duty. 6 sizes.
Model R — inverted unit with discharge hoods at bottom. 12 sizes.
Model S — vertical unit with side blower to permit proper location of air mixing dampers. 15 sizes.
Model C — horizontal ceiling suspension unit for space saving. 13 sizes.

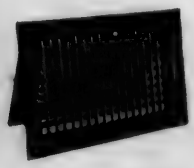
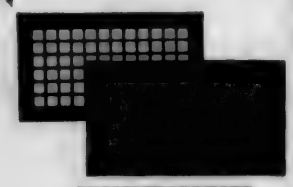
200,000 to 2,000,000 BTU Capacities

Write today for complete information and specifications.

NATIONAL HEATER COMPANY, INC.
2180 Charles Avenue, St. Paul 4, Minn.

"GENERAL"
the name that stands for ... QUALITY in air conditioning
REGISTERS and GRILLES
Already acclaimed one of the leaders in the commercial grille field, the consistent quality of General products is bringing the same "preferred acceptance" across the country—with those who know.
G-R precision workmanship—and mass output—are the result of the finest in high-production facilities. Investigate the line that's—"Second to None."

EVERYTHING STREAMLINED
General adjustable registers and grilles are streamlined throughout for appearance and operating efficiency, including fins, damper blades, and radius edges of the solid frame.

Silentite DAMPER
Standard on General registers or furnished separately, the *Silentite* opposed-blade damper controls volume without turbulence. Reinforced hollow blades of great strength allows positive gripping of bearings for easy action without rattling.

Cross section shows streamlined contour.

"RANCH HOME"
Adjustable residential winter-summer heating-cooling model.

STAMPED GRILLES
Plain Lattice, Pencil-proof (schools), Sanitary (hospitals).
DUCTROL
Line includes air directors, mounting frames, fusible links, door grilles, various accessories, metals and finishes.

A Complete Line For Cooling and Ventilating
Write for Catalog On Your Letterhead
GENERAL REGISTER CORPORATION
14 Factory Street, Cedar Grove, N. J.

CONTROL RESEARCH

(*Continued from page* 148)

perature and humidity conditions. They are also tested with such advanced equipment as a newly-developed atmosphere chamber patterned after the one used by the U. S. Bureau of Standards. This chamber is believed to be the only one of its kind in industry. It is as accurate as the Bureau of Standards unit and considerably more flexible, Honeywell says.

The chamber provides Honeywell's scientists with a research tool with which they can duplicate any weather condition anywhere in the world. Sensitive controls make it possible to regulate temperature to 1/100th of one degree, and dewpoint to 1/10th of one degree, over a range from minus 60 deg to plus 150 deg. Relative humidity in the "box" can be changed almost instantaneously and the chamber is now being equipped to duplicate atmospheric pressure from below sea-level to above 50,000 feet.

Fundamental information being obtained by Honeywell scientists on such subjects as the effect of ice crystals on vapor pressure can be of great help to meterologists in their studies of weather control and could have far-reaching effects on the future of human comfort, home construction and home heating, and on the operation of hundreds of American businesses and industries.

• **MRT.**—Another valuable tool of the heat transfer and humidity control expert is the company-developed "Two-Sphere Radiometer"—an instrument capable of measuring the mean radiant temperature of a room independently of air temperature and air velocity effects.

Surveys in typical homes indicate that radiation effects alone vary enough with position in most houses to cause human discomfort even though homogeneous and constant air temperatures are maintained.

COOLER PACKARDS

assured by new air conditioning system with 90-second pull-down factory installed.

Packard division, Studebaker-Packard Corp., has announced the development of a new air conditioning system for installation in its luxury class cars. Perfected in research and development work carried out since 1939, the new system is said to cool the inside of a car to a comfortable level in 90 seconds regardless of outside temperatures.

• **ADVANCED.**—Introduction of the system has been advanced nine months ahead of original planning because of the important progress being made in a program to recapture Packard's former position in the luxury car field. Packard is currently allocating more than 45% of its automobile output to luxury models, or more than at anytime since the early 1930s.

Now available as factory installed optional equipment, the Packard air conditioning system is installed in combination with an improved fresh air heater. Price of the

(*Continued on page* 152)

THE WEATHER-CHRON . . . the TIME SWITCH that "Outguesses" the WEATHER

Now no need for guessing what the weather will be and constantly resetting your time switch! Select the comfort hours desired and the WEATHER-CHRON automatically resets itself as the weather changes to provide the needed operation. The outdoor temperatures control time heating starts in the morning and time of cutback at night.

MORE THAN JUST A "TIME SWITCH"

The WEATHER-CHRON stops all heat input to the building when outdoor temperatures raise above an adjustable pre-selected temperature (as 65° F.). Eliminates night setback in extreme cold weather.

It can be used in any space heating control circuit in any type of building where lowered night or weekend temperatures are desired.

Fully described in our new Bulletin 5-355. Write for it today.

PRODUCT OF

AUTOMATIC DEVICES CO., INC.

714 Hillgrove Ave. • Western Springs, Ill.

Air Capacities from 550 to 20,000 CFM Belt and Direct Drive

MODULAR

POWER ROOF VENTILATORS

- Our new and complete line of power roof ventilators with their advanced modern design and new construction features fulfill today's architectural styling and job performance requirements.
- With MODULAR construction the following important features have been accomplished — low profile, maximum strength, maximum net free areas, complete resilient mounting with no metal-to-metal contact between the top cap and body, power section and body, and body to curb base.
- Seven top view sizes available from 30" x 30" overall, increasing by 6" increments to 66" x 66". Ventilator height varies in 5½" increments called the "MODULAR stack."
- Write for booklet that gives complete design, construction and performance data, and shows how to specify the correct Modular Roof Ventilator for maximum performance plus economy.

ROOF VENTILATOR DIVISION

ATMOS CORPORATION

1215 W. Fullerton Ave. Chicago 14, Ill.

Blend It... Hide It... Combine It...

Installed as a continuous strip in window head or sill (as above), AGITAIR STRIPLINE is the only practical means for air curtaining plate glass windows or wall areas to counteract summer heat or winter chill.

AGITAIR®

STRIPLINE

DIFFUSERS

BLEND IT . . . specify AGITAIR STRIPLINE as a continuous decorative unit, or in sections to meet any requirements of interior treatment.

HIDE IT . . . in shallow lighting coves for perfect concealment.

COMBINE IT . . . with unit or continuous lighting fixtures.

AND REMEMBER . . . no matter how you use it — AGITAIR STRIPLINE diffusing vanes create maximum mixing and aspiration . . . quick temperature equalization . . . and correct air distribution over any desired length.

Every Inch a Diffuser . . . the Vanes Make the Difference

AIR DEVICES INC.

185 MADISON AVENUE, NEW YORK 16, N. Y.

AIR DIFFUSERS • FILTERS • EXHAUSTERS

HERE ARE YOUR
big opportunities
FOR NEW BUSINESS • MORE PROFITS

CHROMALOX
ELECTRIC BASEBOARD HEATERS
provide modern • clean • controlled heat for home • shop • office

You have a really hot item to offer in this modern type of comfort heating. It's . . .

FUNCTIONAL—located along *outside* walls, it provides true "perimeter heating" through a combination of radiant and convected heat—counteracts cold downdrafts—puts more heat at floor level.

CLEAN—uses the modern fuel—electricity—no smoke, soot, fumes, leaky pipes.

CONTROLLED—room temperatures controlled individually.

EASILY INSTALLED—for single room or complete installation—for "auxiliary" heating or allover heating system. Only two screws to hold it, two wires to connect it—paint to match walls.

CHROMALOX ELECTRIC BASEBOARD HEATERS

. . . available in sizes to fit every need . . . approved by Underwriters' Laboratories.

To get complete information on selecting, installing and controlling Chromalox Electric Baseboard Heaters, send in the coupon.

EDWIN L. WIEGAND COMPANY
7588 Thomas Boulevard, Pittsburgh 8, Pa.
Designers and manufacturers of electric heating units exclusively since 1917

Edwin L. Wiegand Company, Residential Heating Division A-5489
7588 Thomas Boulevard, Pittsburgh 8, Pa.

Please send me Bulletin 800 on Chromalox Electric Baseboard Heaters.

Name_____
Company_____
Street_____
City_____ Zone____ State_____

COOLER PACKARDS

(*Continued from page* 150)

combination is $652. The design of the system makes for easy installation, and it will be offered for field installation in Packard cars by dealer personnel after production schedules reach target levels.

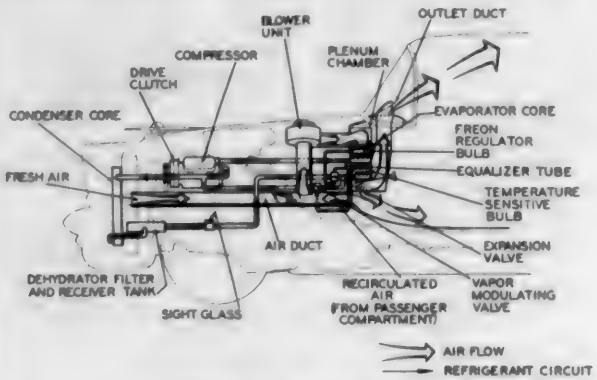


Diagram of Packard system.

• **CONTROL.**—The new Packard unit provides effective cooling where it is most needed for cool-comfort motoring. Outlets are located on the upper portion of the instrument panel or at floor level as desired. Adjustable louvres permit the driver or passenger to direct the course of the cool air.

A single, simplified control is located on the instrument panel, and may be set to maintain the desired temperature level. The system is in operation only when needed, with the need thermostatically controlled. A magnetic clutch disengages the compressor when temperatures are being maintained at a selected level, or when the system is not in use.

Temperatures inside the car are always uniformly comfortable, and there are no drafts or blasts of cool air to hit passengers in the back of the neck.

The Packard air conditioning system has no long distance plumbing, an important factor in minimizing the possibility of refrigerant leakage. All components are located under the cowl or in the engine compartment, leaving the luggage compartment free of space-stealing apparatus.

SOLAR ENGINEERING

to go on display at Phoenix exhibition of engines, heaters, and instruments during World Symposium.

Equipment illustrating recent developments in the field of solar engineering, including a 5-to-10 horsepower sun-driven engine, will be on public display in Phoenix, Ariz., from October 29 through November 13 at the Solar Engineering Exhibit planned in conjunction with the World Symposium on Applied Solar Energy.

The symposium, meeting in Phoenix November 1-5, will draw some 1,000 scientists and engineers from all

(*Continued on page* 154)

...HE WOULDN'T INSTALL
STANDARD STAMPING'S CEILING AIR DIFFUSERS!

And how can anyone be really comfortable without the full dimension heating and air conditioning comfort that only Standard Ceiling Air Diffusers provide. Five flush and five extended models, sized for 6" to 14" ducts. Baked on metallic finish. Also dampers, installation rings, and accessories.

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THIS AUTO REPAIR SHOP USED 6 HEATING UNITS ... until 3 Delta OIL UNIT HEATERS took over!

PROBLEM: The 6 old-fashioned heaters in this Pontiac agency and repair shop were expensive to operate and required costly repairs quite often.

SOLUTION: 3 Delta oil-fired unit heaters replaced them. Installation was easy and cost surprisingly little because they required no boilers, pipes, fittings, valves, etc. They're factory wired and completely assembled ... all ready to hang up.

RESULTS: The building was comfortable throughout the winter; no maintenance was required and operating costs were reduced 60%.

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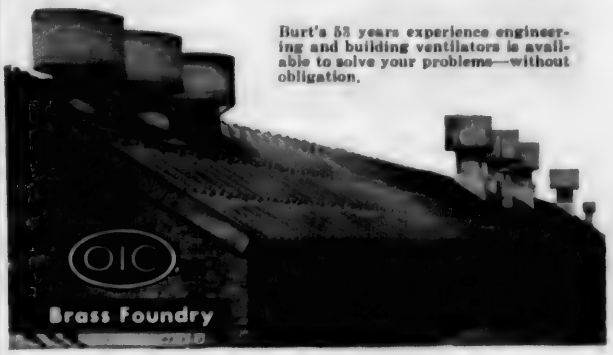
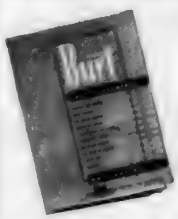
Burt's 53 years experience engineering and building ventilators is available to solve your problems—without obligation.





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SOLAR ENGINEERING

(*Continued from page* 152)

over the world interested in the effort to harness energy from the sun's rays. Many of these conferees will also attend an earlier Conference on Solar Energy—The Scientific Basis, slated October 31 and November 1 at the University of Arizona, Tucson.

Lewis W. Douglas, board chairman of the Southern Arizona Bank and Trust Co., is general chairman of the symposium, sponsored jointly by the Association for Applied Solar Energy, Phoenix; Stanford Research Institute, Menlo Park, Calif.; and the University of Arizona. Merritt L. Kastens, SRI assistant director, is vice-chairman of the event.

• **DISPLAYS.**—An estimated 30,000 to 40,000 persons are expected to attend the Solar Engineering Exhibit where approximately 65 displays of equipment and other demonstrations will be set up in the sun at Phoenix Civic Center to show various methods of converting the sun's energy to useful purposes.

The work of numerous individuals and research groups will be shown at the exhibit, including contributions from the Massachusetts Institute of Technology research program led by Hoyt C. Hottel. Material has also been made available by the University of Wisconsin research group headed by Farrington Daniels.

• **ENGINE.**—Among the 35 working models at the exhibit will be the 5-10 horsepower solar engine manufactured in Lecco, Italy, by the Somor Co. The device, one of several solar engines to be shown, involves a flate-plate collector that uses the sun's rays to evaporate sulphur dioxide which then operates a vapor engine. The gas is condensed by a water-cooled condenser and returned to the collector in a continuous cycle.

A similar one-horsepower model was purchased recently by Stanford Research Institute and is in operation at SRI's Menlo Park laboratories.

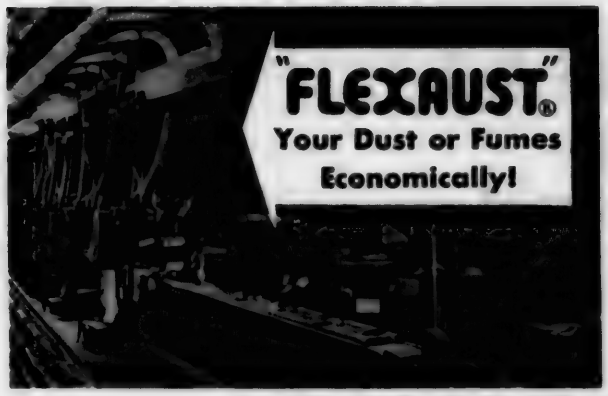
• **INSTRUMENTS.**—Victor Olgyay, associate professor at Princeton University's School of Architecture, has arranged to display a model of a solar-heated house designed for construction in Phoenix. He has also contributed a pair of solar instruments, one a sun energy calculator which computes the sun energy incident on a surface for any latitude and time. The other, called a "shade dial," is a hand-sized device that helps determine the angle of the sun in the sky for locations at any latitude and for any time of the day or year.

Another sun angle calculator will be shown by Libby-Owens-Ford Glass Co., Toledo, Ohio, in addition to their display of models of various farm buildings showing construction methods for improved winter heating.

The Smithsonian Institute, Washington, D.C., will exhibit a sunlight intensity measuring instrument, the Abbot Silver-Disc Pyroheliometer, which is in general use as a calibrating device for field instruments.

Other instruments in general use for sunlight measurements at weather stations have been made available by the U. S. Weather Bureau, along with charts showing the distribution of solar energy over the world and a map display of the bureau's solar energy measuring stations.

(*Continued on page* 156)



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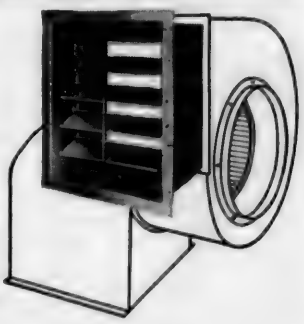

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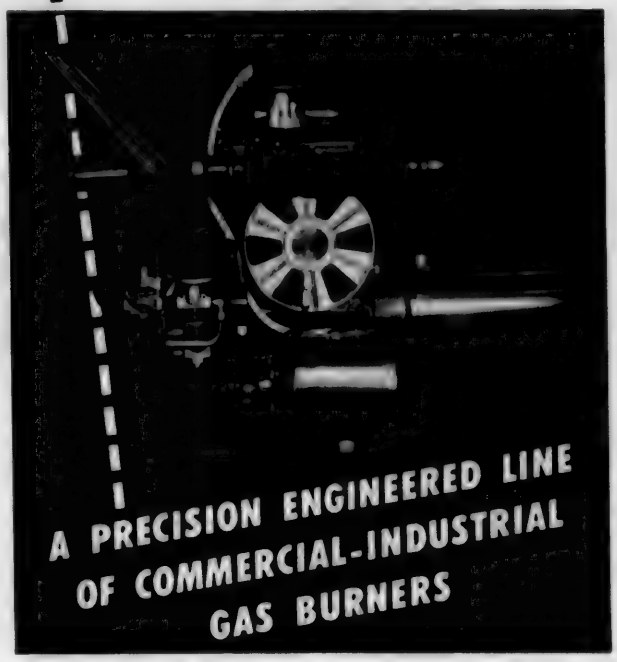

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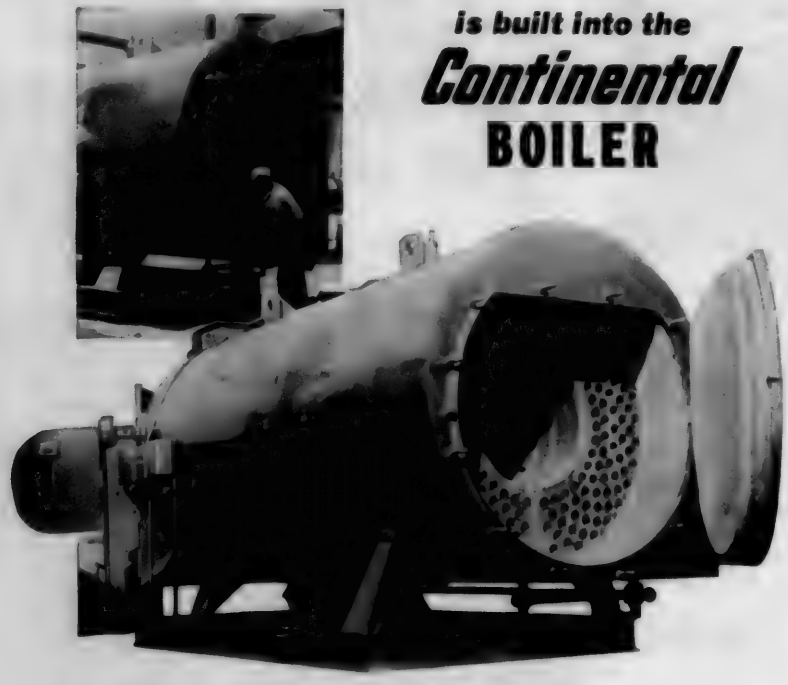

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Rugged, simple in design, accessible—that's the Continental Automatic Boiler. Here are a few reasons why it's easy to keep this packaged steam generator at peak efficiency:

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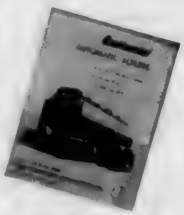

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SOLAR ENGINEERING

(*Continued from page* 154)

F. A. Brooks of the Department of Agricultural Engineering at the Agricultural Experiment Station on the University of California's Davis campus has contributed a Solaranger, a device for studying the pattern of sunlight on structures for any latitude or time of day or year.

The Solaranger consists of a tabletop with an adjustable boom carrying a spotlight to represent the sun. The boom is jointed and calibrated in units of latitude and time so a model structure can be placed on the table and the light source oriented to simulate the proper direction of the sun. Such design factors as overhangs, windows, shrubs and shading devices can then be studied.

Brooks will also display several sunlight measuring instruments, including one with a computer which delivers tabulated, typewritten reports.

Photographs and charts of instruments for measuring sunlight and the results obtained by their use are planned for display by the U. S. Department of Agriculture.

• **HEATERS.**—Visitors to the exhibit will see a production model of a solar water heating collector and steam generator sent to Phoenix by the Meromit, Ashkolon Metal Works, Tel Aviv, Israel.

Maria Telkes of New York University will display her solar food cooking oven that uses four flat aluminum reflectors to direct the sun's rays into an oven that achieves temperatures of about 350 deg F.

Dr. Telkes, noted for research on solar heating, will also have on hand a working model of a sunlight collector using newly-developed absorbing surfaces. In addition, she will show solar stills that use sunlight to evaporate salt water with a cool surface to condense vapor into fresh water.

Other saline water distillers will be demonstrated, including a pair of plastic stills developed at Bjorksten Laboratories, Madison, Wisc.; several small Air Force-developed stills for use on liferafts to produce drinking water; and a roof-type still created at the University of California

for farm use to furnish distilled water for storage batteries.

Western Brass Mills, East Alton, Ill., plans to display a sunlight collector model demonstrating the employment of new methods for fabricating absorber plates using the Roll-Bond technique.

An air heating collector using overlapping glass panes for both insulation and absorption will be set up as a working model by the American Window Glass Co. of Denver.

Relatively efficient, high temperature furnaces for industrial and research work have been created using mirrors to focus the sun's rays. The intense heat (up to 7,000 deg F) created in these solar furnaces makes them useful tools with several applications.

Convair Division of General Dynamics Corp. will display the five-foot mirror solar furnace they use for materials research at San Diego. The device was constructed from a war surplus searchlight mirror and mounted on a four-wheel trailer.

Photographs will be shown of the 30-foot parabolic mirror furnace built by Algeria's Service des Mines Commission de l'Energie Solaire. The furnace, intended for commercial or industrial processing work, is being used in North Africa to produce fertilizer by fixation of nitrogen in the atmosphere.

• **CONVERTERS.**—Several examples of solar energy conversion by electrical, chemical and biological devices will be demonstrated. These will include solar batteries, a portable radio transmitter, an algae culture plant, and sun-wound clocks.

The various exhibits will be arranged under the following classifications: World Distribution of Sunlight and Instruments for its Measurement; Sunlight Collectors and Absorbers; Food Cookers; House and Water Heating Methods; High Temperature Furnaces; Mechanical Engines; Agricultural Aids; and Miscellaneous and Historical Items.

Walter T. Lucking, president of the Arizona Public Service Co., Phoenix, is chairman of the Solar Engineering Exhibit Committee, Edward J. Burda of Stanford Research Institute has charge of assembling devices and materials for the show.

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give you ALL these advantages

• No other manufacturer offers you rust- and corrosion-resistant stainless steel burners as standard equipment . . . plus a choice of aluminized or stainless steel heat exchangers. And there are many other features for reduction of overall costs. In many instances, for example, the savings a Modine Unit Heater allows in installation costs alone offset any difference in price.

WEIGHT COMPARISON

Brand	Capacity (Btu/hr. input)	Approx. Net Weight
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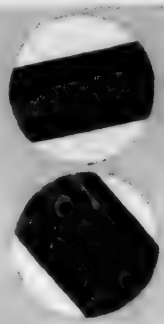
Modine (stainless steel)	105,000	95
Brand "A"	100,000	170
Brand "B"	102,000	196
Brand "C"	90,000	175
Brand "D"	100,000	165
Brand "E"	100,000	210
Brand "F"	100,000	210
Brand "G"	105,000	170

Lower shipping, installation costs

Light weight, without sacrifice of strength or efficiency, makes Modine Unit Heaters easier to handle, faster to install. Also cuts need for expensive support structures.



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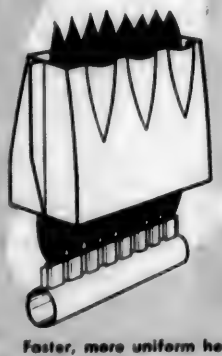
Self-cleaning Modine burner ports have four times the free area of conventional drilled ports. Knife-sharp edges prevent lodging of scale.



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Continuous flame from front to rear of individually fired exchangers, increases radiant heat absorption, uniformly distributes heat through tube.

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Hinged casing swings down, reveals burners, manifold and pilot light. Complete burner assembly may be removed as a unit.

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Carrier knows heating

Over fifty years of leadership in air conditioning have given Carrier unmatched experience in the control of temperature —heating as well as cooling. Yes, Carrier knows heating by experience—and all this engineering skill and leadership contributes to the superiority of Carrier Unit Heaters.

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begin with the outstanding midget-size Model 46T50/70, shown above. Only 23 inches high and relatively light in weight, this propeller-fan type unit heater packs a hefty 50,000 to 70,000 Btu/hr. input (according to fan-motor size). It is designed for use when both space and heating requirements are important.

And for extra-long life, only the Carrier line embodies the major advantage of 16-gauge ALUMINIZED STEEL heat exchanger. It lasts far longer than one of ordinary furnace steel of heavier gauge. The dozen or more other Carrier features are equally impressive. Six additional sizes.

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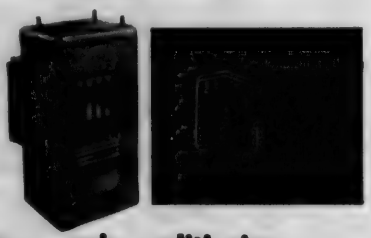
Duct-type unit heaters embody all the major structural and control features of the fan-propelled model—minus fan. By-pass duct application shown here permits year-round air conditioning through the Carrier Weathermaker System. Available in seven sizes.



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COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

WHOLESALE PLUMBING AND HEATING CONVENTION—4th annual convention of the American Institute of Wholesale Plumbing and Heating Supply Associations, Inc., to be held at the Hotel Waldorf-Astoria, New York, N. Y. G. T. Underwood, executive secretary of the Institute, 402 Albee Building, 1426 G St., N. W., Washington, D. C. . . . . **SEPTEMBER 17-21, 1955.**

CHEMICAL ENGINEERS MEETING—National meeting of the American Institute of Chemical Engineers, at the Lake Placid Club, Essex County, New York. Secretary of the Institute, 25 W. 45th St., New York 36, N. Y. . . **SEPTEMBER 25-28, 1955.**

ASME MEETING—Annual meeting of the American Society of Mechanical Engineers, at Roosevelt Hotel, New Orleans, La. Secretary of the Society, 29 W. 39th St., New York, N. Y. . . . . **SEPTEMBER 25-29, 1955.**

GAMA MEETING—Annual meeting of the Gas Appliance Manufacturers Association, at the El Mirador, Palm Springs, Calif. H. Leigh Whitelaw, managing director of the Association, 60 E. 42nd St., New York,. N. Y. . . . . **OCTOBER 12-14, 1955.**

AGA CONVENTION—1955 convention of the American Gas Association and the Pacific Coast Gas Association, at the Statler Hotel, Los Angeles, Calif. Secretary of the AGA, 420 Lexington Ave., New York 17, N. Y. . . . . **OCTOBER 17-19, 1955.**

ASA MEETING—Annual meeting of the American Standards Association, at the Sheraton Park Hotel, Washington, D.C. Secretary of the Association, 70 E. 45th St., New York 17, N. Y. . . . . **OCTOBER 24-26, 1955.**

SOLAR ENERGY SYMPOSIUM—A World Symposium on Applied Solar Energy, sponsored by Stanford Research Institute, Stanford, Calif., to be held at Phoenix, Ariz. Chairman of the Institute, 612 S. Flower St., Room 332, Los Angeles 14, Calif. . . . . **NOVEMBER 1-5, 1955.**

ASME MEETING—75th anniversary meeting of the American Society of Mechanical Engineers, at the Hilton and Blackstone Hotels, Chicago, Ill. Secretary of the Society, 29 W. 39th St., New York, N. Y. . . . . **NOVEMBER 13-18, 1955.**

POWER EXPOSITION—Chicago Exposition of Power & Mechanical Engineering, at the Coliseum, Chicago, Ill., to be held under the auspices of The American Society of Mechanical Engineers, in conjunction with their 75th Anniversary meeting. E. K. Stevens, manager, International Exposition Co., Inc., 480 Lexington Ave., New York, N. Y. . . . . **NOVEMBER 14-18, 1955.**

CHEMICAL ENGINEERS MEETING—Annual meeting of American Institute of Chemical Engineering, at the Statler Hotel, Detroit, Mich. Secretary of the Intsitute, 29 W. 39th St., New York 18, N. Y. . . . . **NOVEMBER 27-30,1955.**

REFRIGERATION EXPOSITION—9th Exposition of the Air-Conditioning and Refrigeration Industry, at Atlantic City, N. J., sponsored by the Air-Conditioning and Refrigeration Institute. The name of this trade show, formerly known as the All-Industry Refrigeration and Air Conditioning Exposition, has been officially changed. George Jones, executive secretary of the Institute, 1346 Connecticut Ave., N. W., Washington, D. C. . . . . **NOVEMBER 28—DECEMBER 1, 1955.**

WARM AIR CONVENTION—42nd annual convention of the National Warm Air Heating and Air Conditioning Association, at Hotel Statler, New York, N. Y. Managing Director of the Association, 640 Engineers Building, Cleveland 14, Ohio. . . . . **NOVEMBER 30-DECEMBER 1, 1955.**

ASRE ANNUAL MEETING—51st annual meeting of the American Society of Refrigerating Engineers, at the Traymore Hotel, Atlantic City, N. J. R. C. Cross, secretary of the Society, 234 Fifth Ave., New York 1, N. Y. . . . . **DECEMBER 1-3, 1955.**

CHEMICAL INDUSTRIES EXPOSITION—25th exposition of Chemical Industries, at Commercial Museum and Convention Hall, Philadelphia, Pa. E. K. Stevens, manager, International Exposition Co., 480 Lexington Ave., New York 17, N. Y. . . . . **DECEMBER 5-9, 1955.**

ATOMIC EXPOSITION—1955 Atomic Exposition, sponsored by American Institute of Chemical Engineers, at Municipal Auditorium and Annexes, Cleveland, Ohio. A. F. Denham, director of Atomic Exposition Management, 931 Book Building, Detroit 26, Mich. . . . . **DECEMBER 10-16, 1955.**

NUCLEAR CONGRESS—Nuclear Congress and Atomic Exposition, sponsored by the Engineers Joint Council, to be held in Cleveland, Ohio. Stewart E. Reimel, secretary of the Council, 29 W. 39th St., New York 18, N. Y. **DECEMBER 12-17, 1955.**

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HEAT LOSSES FROM STEAM PIPING

The accompanying table shows the heat loss (in Btu or in pounds of steam) from bare steam pipes, provided the following are known:

(1) Pipe size and length; (2) steam pressure; (3) whether steam is saturated or superheated and, if the latter, degree of superheat; (4) temperature of air surrounding pipe; and (5) insulation efficiency factor, if loss when pipe is covered is desired.

The tables were computed by Charles A. Pohlig, Assistant to the Superintendent of Steam Distribution, Union Electric Co. of Missouri. Use of the tables is explained in the subsequent examples.

Saturated Steam

Example. One hundred feet of 1 in. bare piping is carrying dry saturated steam at 90 lb pressure, absolute. The surrounding still air temperature is 70 deg. What are the losses per hour expressed in pounds of steam?

Solution. Consult table, column C and proceed downward until 90 lb absolute pressure is reached, thence read across to the right to the 1 in. pipe size column and read 28.40 pounds of steam as the bare piping losses per 100 feet per hour.

If this pipe were insulated with 80% efficiency pipe covering the losses would be

$$(1.00 - .80) \times 28.40 = 5.68 \text{ lb of steam per 100 ft per hr.}$$

Superheated Steam

In case the steam is superheated, proceed as follows:

Example. If 100 feet of 2 in. bare piping is passing steam at 33 lb pressure (absolute) and 25 deg. superheat, surrounding still air temperature is 70F, and insulated pipe covering rated at 85% efficiency is used, what are the losses before and after the covering is applied?

Solution. In column C locate 33 lb pressure absolute and in column B find the corresponding steam temperature at 255 deg. With 25 deg. superheat the steam temperature will be $255 + 25 = 280$ deg. Follow down column B to 280 deg. and note that the corresponding absolute steam pressure is 49 lb. Continue to the right and under 2 in. diameter find the uncorrected bare piping losses as 38.61 pounds of steam per hour per 100 ft. In column D the latent heat of vaporization for 49 lb absolute pressure is 924.2 Btu per pound while for 33 absolute pressure the latent heat is 941.2 Btu per hour. The ratio is therefore $924.2 \div 941.2 = 0.982$. The corrected bare piping loss is therefore $0.982 \times 38.61 = 37.92$ pounds of steam per hour per 100 ft for the superheated line. The losses after covering with 85% efficiency insulation will be $(1.00 - 0.85) \times 37.92 = 5.69$ pounds of steam per hour.

Flat Surfaces

Example. What would be the heat losses from 172 sq ft of virtually flat surface with 90 lb (absolute) steam pressure on one side, and 70 deg. air on the other?

Solution. Continue down column C to 90 lb absolute pressure; follow to the right and under column E find the heat loss to be 737.80 Btu per hour per square foot. For 172 sq ft the heat loss would be $172 \times 737.8 = 126{,}902$ Btu per hour.

Steam losses could be found by continuing over to column F, where the loss is found to be 0.8249 lb of steam per square foot; for the whole surface, $172 \times 0.8249 = 141.9$ lb of steam.

Other Air Temperatures

The table is based on a 70 deg. room air temperature. However, the purpose of column B is to facilitate computations involving other air temperatures.

Example. What would be the steam loss from 100 ft of 1½ inch pipe carrying steam at 42 lb absolute pressure when ambient air is 90 deg?

Solution. The temperature of steam at 42 lb absolute is 270 which gives a 200 deg temperature difference with 70 deg air. The actual temperature difference is $270 - 90 = 180$ deg. In column A find 180 deg temperature difference and opposite this, under 1½ inch pipe, find the steam loss to be 24.41 pounds of steam per hour per 100 feet.

Example. What would be the heat loss per hour from 100 feet of 1 inch pipe if the steam pressure is 17 lb absolute and the room temperature 50 deg?

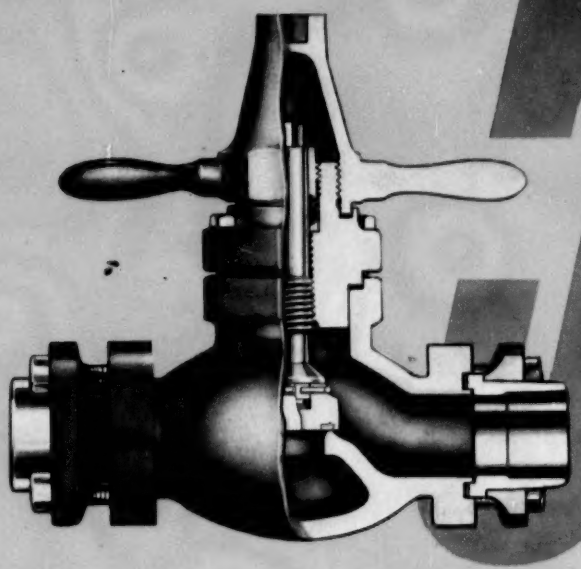
Solution. Under column C find 17 lb and in column B the corresponding steam temperature of 220 deg. The temperature difference is then $220 - 50 = 170$ deg. Under column A find 170 deg temperature difference, and opposite this under 1 inch pipe, find 15.52 pounds of steam per hour per 100 feet.

STEAM LOSSES FROM STEEL PIPING — ½ TO 2 INCH PIPE

A	B	C	D	E	F	Nominal Pipe Diameter, Inches					
						½	¾	1	1¼	1½	2
Temp. Diff., Deg.	Sat. Steam Temp. (Col. A +70 Deg.)	Abs. Steam Press. for Col. B Temp.	Latent Heat, Btu per Lb.	Heat Loss, Btu per Sq. Ft. per Hr.	Heat Loss, Lb. per Sq. Ft. per Hr.	Outside Surface Area, Sq. Ft., per 100 Lineal Feet					
						21.99	27.49	34.43	43.46	49.74	62.18
						Pounds of Steam Lost per Hour per 100 Lineal Feet					
50	120	1.692	1025.1	97.50	0.0951	2.09	2.61	3.27	4.13	4.73	5.91
55	125	1.941	1022.2	109.27	0.1069	2.35	2.94	3.68	4.65	5.32	6.65
60	130	2.221	1019.4	121.04	0.1187	2.61	3.26	4.09	5.16	5.90	7.38
65	135	2.536	1016.5	132.81	0.1307	2.87	3.59	4.50	5.68	6.50	8.13
70	140	2.887	1013.6	144.58	0.1426	3.14	3.92	4.91	6.20	7.09	8.87
75	145	3.280	1010.6	156.35	0.1547	3.40	4.25	5.33	6.72	7.69	9.62
80	150	3.716	1007.7	168.12	0.1668	3.67	4.59	5.74	7.25	8.30	10.37
85	155	4.201	1004.7	179.89	0.1790	3.94	4.92	6.16	7.78	8.90	11.13
90	160	4.739	1001.8	191.66	0.1913	4.21	5.26	6.59	8.31	9.52	11.90
95	165	5.334	998.8	203.43	0.2037	4.48	5.60	7.01	8.85	10.13	12.67
100	170	5.990	995.8	215.20	0.2161	4.75	5.94	7.44	9.39	10.75	13.44
105	175	6.716	992.8	229.68	0.2313	5.09	6.36	7.96	10.05	11.50	14.38
110	180	7.510	989.8	244.16	0.2467	5.42	6.78	8.49	10.72	12.27	15.34
115	185	8.382	986.8	258.64	0.2621	5.76	7.21	9.02	11.39	13.04	16.30
120	190	9.336	983.8	273.12	0.2776	6.10	7.63	9.56	12.06	13.81	17.26
125	195	10.385	980.8	287.60	0.2932	6.43	8.06	10.09	12.74	14.58	18.23
130	200	11.525	977.7	302.08	0.3090	6.79	8.49	10.64	13.43	15.37	19.21
135	205	12.772	974.6	316.56	0.3248	7.14	8.93	11.18	14.12	16.16	20.20
140	210	14.123	971.5	331.04	0.3408	7.49	9.37	11.73	14.81	16.95	21.19
145	215	16	968.3	345.52	0.3568	7.85	9.81	12.28	15.51	17.75	22.19
150	220	17	965.1	360.00	0.3730	8.20	10.25	12.84	16.21	18.55	23.19
155	225	19	961.7	377.30	0.3923	8.63	10.78	13.51	17.05	19.51	24.39
160	230	21	958.6	394.60	0.4116	9.05	11.31	14.17	17.89	20.47	25.59
165	235	23	955.0	411.90	0.4313	9.48	11.86	14.85	18.74	21.45	26.82
170	240	25	952.0	429.20	0.4508	9.91	12.39	15.52	19.59	22.42	28.03
175	245	27	949.0	446.50	0.4705	10.35	12.93	16.20	20.45	23.40	29.26
180	250	30	945.2	463.80	0.4907	10.79	13.49	16.89	21.33	24.41	30.51
185	255	33	941.2	481.10	0.5112	11.24	14.05	17.60	22.22	25.43	31.79
190	260	35	938.4	498.40	0.5311	11.68	14.60	18.29	23.08	26.42	33.02
195	265	39	934.4	515.70	0.5519	12.14	15.17	19.00	23.99	27.45	34.32
200	270	42	931.4	533.00	0.5723	12.58	15.73	19.70	24.87	28.47	35.59
205	275	45	928.2	553.48	0.5963	13.11	16.39	20.53	25.92	29.66	37.08
210	280	49	924.2	573.96	0.6210	13.66	17.07	21.38	26.99	30.89	38.61
215	285	53	920.9	594.44	0.6455	14.19	17.74	22.22	28.05	32.11	40.14
220	290	58	917.0	614.92	0.6706	14.75	18.43	23.09	29.14	33.36	41.70
225	295	62	913.4	635.40	0.6956	15.30	19.12	23.95	30.23	34.60	43.25
230	300	67	909.6	655.88	0.7211	15.86	19.82	24.83	31.34	35.87	44.84
235	305	72	906.0	676.36	0.7465	16.42	20.52	25.70	32.44	37.13	46.41
240	310	78	902.1	696.84	0.7725	16.99	21.24	26.60	33.57	38.42	48.03
245	315	84	898.3	717.32	0.7985	17.56	21.95	27.49	34.70	39.72	49.65
250	320	90	894.4	737.80	0.8249	18.14	22.68	28.40	35.85	41.03	51.29
255	325	96	890.6	761.82	0.8554	18.81	23.51	29.45	37.18	42.55	53.19
260	330	103	886.5	785.84	0.8865	19.49	24.37	30.52	38.53	44.09	55.12

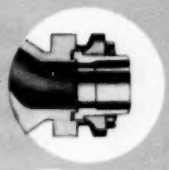
FIVE TYPES OF CONNECTIONS IN HENRY

SEMI-STEEL WING CAP VALVES



F.P.T.
In Valve Body
½" thru 2½"

O.D. Solder
Brass Adapter
and Steel Flange
1⅜" thru 5⅛"



Steel Butt Weld Adapter
and Steel Flange
1¼" thru 5"

One Piece F.P.T. Flange
1¼" thru 6"

One Piece Slip-on Weld Flange
1¼" thru 6"

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Specify Henry Wing Cap Valves with their wide choice of end connections and your installation costs will always be low.

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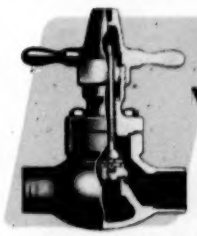

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No. 65

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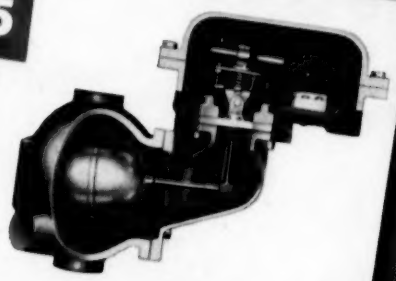
Explosion Proof Electric Controller



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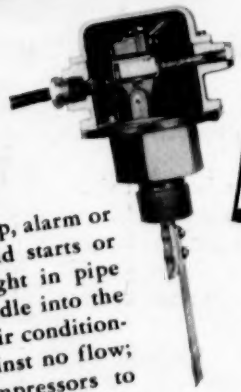
No. E-2

Flow Switch



Serves to start or stop a pump, alarm or meter when flow of a liquid starts or stops. Can be mounted right in pipe line; extends a flexible paddle into the pipe. Is being used on air conditioning systems to guard against no flow; with generators and compressors to assure flow of cooling water; in mixing and blending various liquids; and for many other jobs. For working pressures up to 150 lbs.

Your Jobber Stocks Them

No. 18

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